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REPORT

ON THE OPERATIONS OF THE

DEPARTMENT OF AGRICULTURE, BENGAL,

FOR THE YEAR

1921-22.

IMPERIAL COUNCIL OF AGRICULTURAL

CALCUTTA :
THE BENGAL SECRETARIAT BOOK DEPOT.
1922.

[Price, Rs. 2-9.]

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DEPARTMENT OF AGRICULTURE, BENGAL.

No. 8916A.

FROM G. EVANS, ESQ., C.I.E., M.A.,
Director of Agriculture, Bengal,

TO THE SECRETARY TO THE GOVERNMENT OF BENGAL,
DEPARTMENT OF AGRICULTURE AND INDUSTRIES.

Dacca, the 31st July 1922.

SIR,

I have the honour to submit the Annual Report of the Agricultural Department, together with the reports of the expert officers, for the year 1921-22.

I have the honour to be,

SIR,

Your most obedient servant,

G. EVANS,
Director of Agriculture, Bengal.

TABLE OF CONTENTS.

Report of the Agricultural Department, Bengal.

	PAGE.
Introductory	1
Section I.—Agriculture	1
Section II.—Sericulture	11
Section III.—Miscellaneous	12

APPENDICES.

I.	Report of the Deputy Director of Agriculture,	Western Circle	14
II.	Ditto	ditto, Eastern Circle	20
III.	Ditto	ditto, Northern Circle	24
IV.	Ditto	Fibre Expert to the Government of Bengal	31
V.	Ditto	Economic Botanist to the Government of Bengal	37
VI.	Ditto	Second Economic Botanist to the Government of Bengal	42
VII.	Ditto	Agricultural Chemist to the Government of Bengal	44
VIII.	Ditto	Chinsura Farm	50
IX.	Ditto	Burdwan Farm	55
X.	Ditto	Gosaba Farm (24-Parganas)	59
XI.	Ditto	Berhampore Farm	62
XII.	Ditto	Dacca Central Farm	64
XIII	Ditto	Tippera Farm	72
XIV.	Ditto	Mymensingh Farm	75
XV.	Ditto	Barisal District Farm	78
XVI.	Ditto	Cattle Farm, Rangpur	80
XVII.	Ditto	Rangpur Demonstration Farm	88
XVIII.	Ditto	Burirhat Farm, Rangpur	92
XIX.	Ditto	Rajshahi Farm	97
XX.	Ditto	Bogra Farm	100
XXI.	Ditto	Pabna District Farm	104
XXII.	Ditto	Kalimpong Farm	107
XXIII.	Ditto	Special Officer, Agricultural Education	118
XXIV.	Ditto	Deputy Director of Sericulture, Bengal	119
XXV.	Ditto	Sericultural Research Expert	130
XXVI.	Ditto	ditto School, Rajshahi	135
XXVII.	Glossary		137

[Maximum limit, 18 pages.]

REPORT

OF THE

AGRICULTURAL DEPARTMENT, BENGAL,

FOR

1921-22.

INTRODUCTORY.

The period through which the world as a whole is now passing is one of shortage of both food and raw material—the aftermath of the great war. The result in Bengal, as in other agricultural countries has been to witness a great awakening of public interest in matters agricultural. These factors have stimulated discussion in the enlarged Council and at the Board of Agriculture meetings, and it is now generally conceded that the possibilities that lie before the Province in the shape of agricultural development are very great and that the activities of the Department need expanding. As a natural result, frequent conferences were convened by the Hon'ble Minister in charge and numberless questions have had to be answered, with the consequence that the office work has increased enormously. There appears to be a serious danger that the Director of Agriculture will not have the necessary time in future for his agricultural work and may tend to become mainly a letter answering machine unless this tendency can be checked. The matter requires serious attention as with the increase in the number of farms and of departmental activities generally it is obvious that close inspection by the Director will become more and more essential.

This report is, as usual, intended as a general review of the operations of the Department as a whole and includes as Appendices the reports of the Deputy Directors of Agriculture, Deputy Director of Sericulture, and of the several Scientific Research officers.

A map showing the centres of activities of the Department is attached to the report for the first time.

SECTION I.—AGRICULTURE.

Administration.—I held charge of the Department throughout the year. Changes *in personnel* of the staff were comparatively few and mainly confined to officiating arrangements consequent on the grant of leave or deputation. Mr. K. McLean proceeded on combined leave for one year from 18th October and Mr. R. S. Finlow returned in February. Mr. J. N. Sarkar of the Bengal Agricultural Service continued to act as a Deputy Director of Agriculture. In the cadre of the Bengal Agricultural Service two new posts of Superintendent of Agriculture were sanctioned for the Chinsurah Farm and the Darjeeling district, and Babu Bhabatosh Dutt and Mr. H. R. Edmunds were confirmed in these vacancies. Dr. N. Gupta, Superintendent of Agriculture, was placed on special duty in connection with Agricultural Education. The three posts of Head Assistants of the Fibre, Botanical and Chemical Sections were placed in the Bengal Agricultural Service, and Babu Nirmal Chandra

Bose, Mr. S. G. Sharangapani and Babu Gosto Behari Pal were confirmed as Assistant Fibre Expert, Assistant Economic Botanist and Assistant Agricultural Chemist, respectively. Babu Tara Nath Roy, Field Assistant under the Fibre Expert, and Babus Chuni Lal Mustafi and Sachindra Krishna Dutt of the Subordinate Agricultural Service were appointed to officiate in the Bengal Agricultural Service.

In the Sericultural Section Mr. P. C. Choudhury succeeded Rai Sahib A. C. Ghose, who retired in June, and was appointed to the Indian Agricultural Service as probationary Deputy Director of Sericulture in October. Babu Surendra Nath Bose was confirmed in his appointment as First Superintendent of Sericulture, and Maulvi Shaikh Abdullah, Sub-Deputy Collector, was appointed to act as Second Superintendent of Sericulture on probation.

During the year the permanent strength of the Upper Subordinate Agricultural Service, which includes Farm Superintendents and Agricultural Officers, was increased from 34 to 39. The permanent cadre of the Lower Subordinate Agricultural Service of Demonstrators consisted of 137 officers. In the matter of superior staff, Bengal is still seriously handicapped compared with other provinces. Two more Deputy Directors are urgently required for the Burdwan and Chittagong Divisions. The need for strengthening the subordinate staff is also great in view of the rapid development of district work. It is useless opening out agricultural associations or seed farms or expanding in other direction unless the Department can place trained men in charge to supervise or assist and control the work. Considerable progress has also been made on the research side, and here again an increase of staff is desirable particularly perhaps in the chemical section.

Tours.—I spent 215 days on tour. A considerable amount of my time was taken up by the Hyacinth Committee and the numerous other conferences and committees held during the year. The pressure of adminstrative work, particularly in connection with the proposals for the expansion of the Department curtailed to some extent, I regret to say, my inspection of farms and of the scientific work of the Department. I nevertheless contrived to visit most of the farms and almost all the important centres of work, although on some occasions my visits were necessarily of a briefer nature than I should have liked.

Agricultural Education.

As there is no Agricultural College in Bengal, agricultural students from this province have hitherto attended the Agricultural College at Sabour. It has now been decided by the Government of Bihar and Orissa to discontinue this institution from next year. This means that the three provinces of Bengal, Bihar and Orissa and Assam, comprising a population of about 90 millions, which is mainly agricultural, are now without any means of providing a scientific agricultural training to their young men. The case for the proposed Agricultural Institute at Dacca for which the land has been acquired and plans and estimates drawn up and sanctioned, is therefore a very strong one, and it is hoped that funds will be provided so as to enable construction work to proceed. During the session 1921-22 the Bengal students at Sabour numbered 35. Of these, 12 passed the certificate examination and 18 were promoted from the first to the second year class. Of the three Bengal Government stipendiaries in the second year one failed to pass the final examination. He was, however, been allowed to continue. The Bengal stipendiary at the Nagpur Agricultural College has passed the final examination.

No appreciable progress in the matter of nature study in primary schools has been reported by the Education Department.

The two experimental agricultural vernacular schools at the Dacca and Chinsura Farms, which were opened in 1920 and 1921 respectively for the training of *bonâ fide* cultivators' sons in up-to-date methods of agriculture combined with general education, continued to show good progress. The two years session of the Dacca School closed in December. Of the 30 boys who were originally admitted, 27 completed the full course and it is noteworthy that several of them have continued their traditional occupation

and have secured land under the Khas mahal or Court of Wards' Estates. It is most unfortunate that for financial and other reasons the Chinsura school has not yet been completely equipped with the necessary buildings, roads, high land, etc., and this has seriously hindered the staff in their work. There were only 12 students in the first year class at the time the annual examination was held in December. The whole subject of agricultural education was discussed at the Provincial Board of Agriculture in August, and it was then decided to convert these two schools into secondary agricultural schools in order to give a higher form of training to the sons of peasant proprietors or those who have a direct interest in the land. The curriculum is designed so as to train the students to farm their own lands or become demonstrators in the Department or teachers in the proposed elementary agricultural schools. At the Dacca School the second year class now contains 15 students, including 9 apprentices recruited from men under temporary training on the farm. The first year class has been opened with 12 stipendiaries, and four others study at their own expense. At Chinsura there are 10 students in the second year class and 11 new recruits in the first year class. The curriculum and arrangements are somewhat provisional at present and will probably require modification in the light of future experience. Every endeavour is being made, however, to make these institutions a success.

A scheme for establishing farm or elementary agricultural schools of a cheaper type was formulated by the Hon'ble Minister for Agriculture, and a memorandum on the subject was circulated to the public for an expression of opinion. The opinions received were discussed at a meeting of the Provincial Board of Agriculture after the close of the year and the scheme with certain modifications was submitted to Government. There is a popular demand for vocational education at present, but it is in my opinion doubtful whether the Agricultural Department is the most suitable agency for managing elementary schools of the type proposed. The proper function of the Agricultural Department is research, experiment, and the demonstration of improvements, and I am inclined to think that with the exception perhaps of special institutions designed for training our own staff we should be unwise to venture into the realms of education. The agricultural classes at the Amarpur Middle English School in Burdwan district and the Durgapur High English School in Chittagong district continued to receive the attention of the Department. The progress made in these schools was not altogether satisfactory. It is proposed to remodel these classes as soon as the general scheme for elementary agricultural schools has received the approval of Government.

Research and Experiment.

The research work of the Department continues to make good progress and compares well with the research that is being done by other Agricultural Departments. Research is mainly concentrated at the laboratories on the Dacca Central Farm, but every year there is a tendency to extend the scope of investigation and small field laboratories have been temporarily opened for plant-breeding work at Chinsura and for tobacco work at Burirhat. The laboratory accommodation at Dacca is rapidly becoming too small and will have to be extended. It is a matter for consideration whether we should aim at extending the main laboratories at Dacca or should open another series of laboratories for the new divisional experimental station which, it is hoped, to be able to open shortly in the Presidency Division.

Fibres.—As usual, jute continued to employ the main attention of the Fibre Expert. In the season under report 559 single plant cultures of C. Capsularis were under observation at Dacca being grown against D. 154 as a standard. There were also a number of hybrids. Only 10 of these showed favourable indications and are considered worthy of coming into the variety tests. As a matter of fact the standard of new races, such as R. 85 and D. 154, is so high that it is difficult now-a-days to raise new varieties that are superior. However two new kinds, viz., D. 27 and a hybrid, are being tested on a large scale as they appear to possess certain desirable qualities. With regard to the new hybrids which were derived by crossing a Formosa jute

with a local variety, two are promising as far as height is concerned, but it remains to be seen what the percentage of fibre is like.

With regard to chlorosis in jute, investigations in collaboration with the Economic Botanist were continued and 157 single plant cultures were under observation. There seems to be a connection between the devolopment of the surface root system and the incidence of this disease. Liability to chlorosis is apparently transmissible from parent to progeny. Work on the length of ultimate filaments was continued and a large number of measurements made. It seems probable that the length of the filament is an hereditary function.

The experiments with jute in the Ganja tract of the United Provinces were continued on a larger scale with great success and 97 acres of jute were grown. In view of the current high prices of jute the area under this crop in the United Provinces is likely to extend.

Experiments were continued by Mr. Finlow at Pusa on a new machine designed for extracting fibre from Sunn Hemp. With regard to flax, samples of the crop grown at Cawnpore were well reported on in London. Minor investigations were also carried out on sida and sisal.

The First Assistant conducted experiments on the utilisation of waste products for paper making. He reported that a useful paper could be made out of jute sticks, but that the betelnut husk is less promising from the manufacturing point of view.

Water Hyacinth.—A Water Hyacinth Committee was appointed by the Government of Bengal with Sir Jagadish Chandra Bose as President and the Director of Agriculture as Secretary. This Committee was instructed to advise Government on the best ways of combating this pest, and its report will shortly be submitted to Government.

Botanical Section.—(*a*) *Paddy.*—Work on *aman* paddy was continued on former lines at Dacca, Chinsura and Rangpur. Three recent selections were tested at Dacca against *indrasail* and proved to be very heavy yielders. At Chinsura a new variety *dudsar* was tested on a considerable scale and beat the local *nagra* by 14 per cent. It seems probable that this new variety, which is earlier in ripening than *indrasail*, but otherwise similar, will prove very suitable for Western Bengal.

Intra-varietal selection on two selected varieties of *aus* paddy, viz., *kataktara* and *Surjamukhi*, have been carried out for the last seven years. By this method single plants were selected according to the number of grains per tiller. Some of these lines so selected have been tested against the original pure line of *Kataktara* and have given increases of 34 to 41 per cent.

Work on cross fertilisation was continued, and the results have been published in the form of a Pusa Memoir. It appears that there is a strong correlation between colour and earliness of *aus* and absence of colour and lateness of *aman* paddy, and these facts should prove of great value to the plant breeders.

The work on transpiration was continued, and one other fact brought out is that transpiration is a varietal character.

Work on deep-water paddy was continued by the Second Economic Botanist, but will have to be continued for some years before definite results can be expected. This crop, owing to the conditions under which it grows, is one of the most difficult that the plant-breeder has to deal with.

(*b*) *Rabi crops.*—With regard to *rabi* crops, a survey and further selection of varieties of *Phaseolus* (*mati-kalai*) were continued by Dr. Hector, and on *massori* (Ervum Lens), *khesari* (Lathyrus Sativus), and the *Brassicas* by Mr. Dutta. The work on these *rabi* crops in the past has been greatly hindered by the fact that the red soil of the Dacca Farm is entirely unsuited for the growth of *rabi* pulses and oilseeds, such as mustard and *sarson*. This soil dries out immediately the monsoon is over, and as a result the early varieties invariably give the best yield, although they are by no means the biggest yielders in reality when grown on the alluvium which comprises the great majority of the soils of Bengal. By arrangement with the Collector of Dacca it has been decided to take over a portion of a *char* in the Buriganga close to Dacca for the purpose of conducting future experiments on these

crops, and it is now hoped that much more rapid progress will be made than was possible in the past.

(*c*) *Cotton.*—Experimental work on this crop was in the hands of the Second Economic Botanist, and was conducted mainly at Chinsura, Dacca and Mymensingh. The rainy season crop did fairly well in the year under report, because the autumn months were dry and were therefore favourable for the development of the bolls, diseases and pests not being so prevalent as usual. Of the long, stapled varieties tried, Dharwar American gave the best results. As these cottons occupy the land for the whole year, types have been selected which are early ripening and will, it is hoped, permit of a second crop being taken after cotton. Cotton was also tried as a winter crop at Dacca and Mymensingh, but did not do well owing to unfavourable weather conditions. Possibly, if sowings could have been done earlier, better results might have been obtained, and the experiments will be repeated this year. In response to numerous applications and under the instructions of Government, arrangements have been made to import Dharwar American seed and to issue it in small lots to persons who wish to attempt cotton cultivation, and a vernacular bulletin describing the cultivation of this variety has also been issued. In spite, however, of these arrangements it has been found extremely difficult in most districts to dispose of the cotton seed to genuine cultivators, and the demand seems to have arisen mainly from the *bhadraloks.* Experiments in the past have indicated that there is little chance of establishing cotton as a field crop on a large scale in most parts of Bengal, because the climatic conditions are against the successful cultivation of this crop. This appears to be realised by the real cultivator who is not likely, with jute at its present price, to forsake it for cotton. In accordance with the orders of Government a Cotton Committee for Bengal has been formed to advise Government on its policy with regard to this work. A cotton survey has been started by the two Economic Botanists in accordance with the orders of Government. Some difficulty has been experienecd in obtaining material to work with, as many districts report that no cotton is grown and others are only forwarding small samples of tree cotton. It is interesting to note, however, that a type of plant has been found at Dewanganj which is similar to the one described many years ago by Dr. Roxburgh as the Dacca muslin cotton, and seeds have been secured.

Chemical Section.—With the appointment of a permanent Agricultural Chemist, this section has shown a great deal of activity during the year. A considerable number of soil samples from Government farms and demonstration centres have been analysed and will be useful in connection with the provincial soil survey that it is hoped eventually to complete.

A large number of sugarcane analysis was carried out and a promising thick cane from the Coimbatore Breeding Station is now under observation at Dacca. Important experiments have been started with a view to finding out the cause of the high glucose content of canes grown on red laterite soil, and whether irrigation will have any effect in improving the quality. Manuring of sugarcane has received particular attention, and it is hoped to lay down a standard.

Mr. Carbery has also taken up work on date sugar which had been started by Dr. Annett when he was Agricultural Chemist. A new furnace for boiling date palm juice has been designed and has given promising results, as it has been found to greatly minimise the consumption of fuel which is a great difficulty in the Presidency Division. A new line of work has also started with a view to finding out whether the action of the water-weed known as Patashawala used in Jessore for refining date sugar is purely physical or not.

With regard to tobacco, a number of analyses has been made and the manuring requirements of the crop have been carefully studied. In pot-culture experiments a promising mixture seems to be fish guano and lime, and this result will be tested on the field scale this year. Experiments were also made with flue-curing of the leaf and will be continued.

Another interesting line of research is the investigation of the effect of bone meal on the laterite soils. It is too early yet to publish results, but the

effect of bone meal on the paddy crop which is known to increase the yield, seems to have had the effect of causing early ripening and also drought resistance.

With regard to this section I am of opinion that an extension both of staff and laboratory accommodation is urgently required.

Entomology.—The Entomological Assistant investigated 17 insect-pests during the year under report, and several new life-histories were worked out and remedial measures recommended. The pests attacking the orange plantation in the Kalimpong Khas Mahals received particular attention. It is reported that the mango weevil in Eastern Bengal has greatly decreased since the cyclone of September 1919, as the weevils were starved out owing to the failure of the crop in the year following. This officer is kept busy throughout the year dealing with outbreaks of pests all over the province.

Mycology.—The Mycological Assistant worked under the orders of Dr. Hector and in consultation with the Imperial Mycologist at Pusa as regards fungoid diseases. At the request of the Commissioner of the Chittagong Division a survey of the districts of Noakhali and Comilla was made to find out the extent of damage done by the *ufra* disease. Demonstrations of burning the stubbles in dry weather, where the disease occurs, were carried out, but it was found that since the cyclone *ufra* in this area has been diminished owing, it is said, to improved drainage. The red rot disease of sugarcane was mild compared with the previous year, but a thorough selection of sugarcane sets was done on the Dacca Farm and the farm apprentices trained in the work. The oat crop at Burirhat Farm was attacked by rust (Puccinia lolii). This is only the second time this rust has been reported in India.

At the request of the Imperial Mycologist an enquiry was made into the extent of the bud-rot disease of the palmyra palm. This disease caused a large amount of damage in the Madras Presidency and Government had to spend several lacs of rupees in combating it. In Bengal, however, the palmyra palm is not considered of economic importance, and fortunately the cocoanut has not yet been attacked in this Province. The future progress of this disease, which is at present confined to a few villages in the districts of Hooghly and Burdwan, will be closely watched as if it shows signs of attacking cocoanut and arecanut, immediate action will be necessary.

Research Station for Western Bengal.— It will be seen from the preceding paragraph that in Eastern Bengal progress in agricultural improvement has been more rapid than in Western Bengal. This, I believe, is due to the existence of a properly equipped research station at Dacca. The natural result has been that the problems of Eastern Bengal have received more attention, because the conditions in Western Bengal are very different from those that obtain at Dacca. If a research station could be similarly established in Western Bengal, it is probable that equally good results would be obtained as the experts would then be able to deal with local problems on the spot. The establishment of such a station is receiving the urgent attention of the Department. Several sites have been inspected for the purpose, and it is hoped that the scheme will take a definite shape very shortly.

Agricultural Stations and Farms.—A detailed account of the work done at each of the Agricultural Stations is included in the appendices to this report. During the year new farms at Barisal and Pabna were completed and work was started. Due to lack of funds, building operations on most of the new farms are being delayed. The district farms at Birbhum and Bankura have been laid out, but the buildings have not yet been completed. The laying out of the Murshidabad Farm is in progress, and the acquisition of land for the farms at Faridpur and Dinajpur is completed, but none have yet been equipped with buildings. No work on the Jalpaiguri farm at Mainaguri has also been possible for the above reasons.

It has been decided to enlarge the scope of the experimental farm at Rajshahi with the object of converting it into a divisional farm for the Northern Circle.

The complete list of experimental farms managed by the Department is as follows :—

Serial No.	Name.	District.	Class.	Remarks.
1	Central Farm, Manipur ...	Dacca ...	Agricultural Research Station.	
2	Chinsurh	Hooghly ...	Ditto.	
3	Pala Farm	Burdwan ...	District Farm ...	Recently transferred by Maharajadhiraj of Burdwan.
4	Bankura	Bankura ...	Ditto ...	Buildings nearly finished. Work commenced.
5	Berhampore	Murshidabad ...	Ditto ...	Work started with temporary buildings.
6	Rajshahi	Rajshahi ...	Ditto.	
7	Bogra	Bogra ...	Ditto.	
8	Pabna	Pabna ...	Ditto ...	Just completed.
9	Rangpur	Rangpur ...	Ditto.	
10	Ditto	Ditto ...	Cattle Farm.	
11	Burirhat	Ditto ...	Tobacco Farm.	
12	Kalimpong	Darjeeling ...	Demonstration Farm	St. Andrew's Colonial Homes.
13	Mymensingh ...	Mymensingh ...	District Farm.	
14	Comilla	Tippera ...	Ditto.	
15	Barisal	Bakarganj ...	Ditto ...	Just completed.
16	Gosaba	Sundarbans ...	Demonstration Farm	The property of Sir Daniel Hamilton, Kt.

Cattle Breeding.—There is at present one cattle-breeding farm in Bengal, at Rangpur, where two herds are maintained—one of *deshi* cattle and one of *deshi* cows crossed with Hissar bulls. Experiments have now been continued for about ten years and so far as they go, they indicate that improvement can be effected by better methods of feeding and rearing *deshi* cattle, but that much more rapid progress is obtained if *deshi* cows are crossed with bulls of good pedigree. The policy of the Department in the future will be devoted towards breeding a dual purpose animal in which the male will be a better plough bullock than the existing animal available, and the cows better milkers.

In order to effect this, it is necessary to work on the principle that the milking capacity is an hereditary character and that the change can therefore be most rapidly effected by using bulls of known milking pedigree. In pursuance of this policy there fore small herds of two famous milking breeds, viz , the Red Scindi and Montgomery (or Saniwal) are being established at Dacca and Chinsura Farms and their performances in this climate are being closely watched. The Red Scindi herd at Dacca has already evoked favourable comment. Stud bulls of these three milking breeds are now being placed on all the Government farms and their service will be available to the cow-keepers in the neighbourhood.

The demand for milk and dairy produce throughout Bengal is very great and is increasing, and the dairy industry therefore should prove very profitable if trained men are employed. There is however at present a great lack of knowledge in the principles of dairy farming and cattle-breeding and until the local agriculturists can acquire more knowledge on the subject rapid progress cannot be expected.

The appointment of a cattle-breeding expert who will be able to elaborate a cattle-breeding policy for the whole of Bengal followed by the opening of one or two dairy schools, with a view to affording means of practical training in this important industry, are matters of imperative urgency.

District Work.—The year under review has again been one of steady progress all round. Everywhere there is a demand for more men for district work and there are many branches of work still left untouched and our staff accordingly needs supplementing. The Deputy Director's reports published as appendices give a detailed account of the demonstration work undertaken.

Propaganda Work.—The services of a senior District Agricultural Officer were placed temporarily under the Commissioner of the Burdwan Division for propaganda work. He made considerable tours in Bankura, Midnapore and Birbhum, and delivered lectures illustrated with magic lantern slides on various subjects dealing with agriculture.

Seed Distribution.—Seed supply is one of the most important branches of work of this Department. The problem is a dual one, viz. (1) the provision of large quantities of seed of new and improved varieties, and (2) the adoption of measures to ensure that the seed is kept pure after distribution. With this end in view a scheme for the estabishment of a large network of private seed farms, which will work in connection with and will be supplied with seed from the Government farms has been worked out. The system which was described in last year's report is meeting with a certain amount of success, and seems to offer great scope for future development. At present there are no less than 52 of these seed farms established. They are supervised by the departmental officers and grow departmental seeds for distribution. The agencies utilized are as follows :—

Private (zamindars)	35
Agricultural Co-operative Associations	4
Khas Mahal Estates	9
Court of Wards' Estates	4
Total ...	52

Some of these farms are 100 bighas or more in area, others only 5 bighas or so, but an endeavour is being made in every case to impress on the owner the necessity for preserving the purity of the seed and of establishing a good name, as on the two factors of unremitting care and commercial honesty will depend the success of any venture of this sort.

It has frequently been said that the Agricultural Department is paying too much attention to such work as seed distribution and that the time and staff so employed might be more profitably utilised for research and experiment. This is possibly correct, but it must be remembered that in Bengal unlike most other countries no agency at present exists to take up the distribution work, and our present policy is to try and create such an agency. To this end much attention is now being paid to the formation of seed farms and the organization of Co-operative Agricultural Associations.

Jute Seed.—The keen demand for the departmental jute seeds continued during the year. The cultivator now thoroughly realizes that these varieties yield 25 per cent. more than the local kinds. The demand was so great particularly in the Dacca Division that many requisitions had to be refused for want of seed. Until our district farms and the private seed farms have been fully developed we must continue to remain dependent on the seed-growers of Bihar and Assam.

Paddy Seed.—The *Indrasail* variety still maintains its reputation as the best of the transplanted *aman* paddies, over the greater part of the Province, and the demand for pure seed continues to be great. Dr. Hector has now produced new strains which may prove valuable on account of their earlier ripening and heavy yield. One of these called *Dudsar* seems likely to suit Western Bengal conditions and is now being distributed.

As regards *aus* paddy, *Kataktara* has held its position of superiority owing to its fine white grain and high yield. This paddy was in great

demand over the greater part of the province. Another *aus* variety named Charnock is in some demand on account of its exceptionally fine quality.

Sugarcane.—The cultivation of sugarcane appears to be extending in the province, but irrigation difficulties in some areas appear to limit to rapid expansion. The Yellow *tanna* has sufficiently proved its superiority over other varieties to justify its distribution on a wide scale. The demand for sets of this variety was so great that it was impossible for the Government farms and private seed farms to cope with it.

The report of the Indian Sugar Committee has been considered. The Committee are generally of opinion that there is little prospect of any considerable expansion of the cane area in Bengal. Provided the difficulties of irrigation and the supply of manure can be overcome, however, the Presidency Division would appear to offer great possibilities in this direction. The climate is admirably adapted for cane, and the soil also is a suitable loam and is on the whole high and well-drained. The other recommendations of the Committee are a botanical and chemical survey of the canes, trials of exotic varieties, selection of sets, manurial experiments, adoption of the Java system for the rapid propagation of sets and the manufacture of *gur* by improved processes. Steps have already been taken by this Department as regards most of these recommendations and effect will be given to the others as soon as funds and staff permit.

Another matter on which stress has been laid is the improvement of the date-palm sugar industry in Bengal. It has been held that there are great possibilities of improving both the yield and quality of *gur* turned out in Eastern Bengal. Mr. Annett, the late Agricultural Chemist, Bengal, did a considerable amount of work in this direction. Though his investigations were not completed owing to his transfer to the United Provinces in 1916, much light has been thrown on the industry as a result of his invesrigations. Further enquiries are necessary before we can proceed to consider the steps necessary for the development of the industry, and the enquiry is now being continued by Mr. Carbery, the new Agricultural Chemist.

A simple furnace tested in the Central Provinces and designed by a Mr. McGlashan was tried and proved very cheap and satisfactory and more economical in fuel than the local type. An adaptation of this to suit the date sugar industry has been used with success by the Agricultural Chemist and has been referred to elsewhere.

Groundnut.—The crop is said to be only spreading slowly in the Burdwan Division. Experiments were also tried in the Presidency Division and the Malda District. In the latter place this crop gave satisfactory results, and there was an expansion of area. It is doubtful whether there is a great future before this crop in this province. In Bankura and Midnapore the depredations of wild animals discourage rapid expansion and in other places, the soil sets so hard after the rains are over that the cost of harvesting becomes almost prohibitive. An attempt will be made to obviate the latter difficulty by growing early ripening varieties.

Wheat.—The Pusa wheats Nos. 12 and 4 have given good results in some districts of the Burdwan and Rajshahi Divisions. They have also done better than the local wheat at Murshidabad under irrigation. A system of rogueing and mass selection has now been introduced on the departmental farms, and it is hoped to be able to distribute these varieties on a large scale next year.

Tobacco.—The area under Sumatra Tobacco in Rangpur has considerably increased. The Rangpur, Bhengi and Motihari varieties were tried with success in Dacca and Mymensingh districts. Cigars manufactured at the Mymensingh Farm were much appreciated by the public. The question of opening a cigar factory in the Rangpur district is now under the consideration of Government.

Potatoes.—The area under this crop in the Presidency Division is reported to have considerably expanded. There is also much scope for potatoes in Eastern Bengal. The principal difficulty lies in connection with the seed supply. With a view to meeting this problem a proposal is on foot to establish a small potato farm near Darjeeling at a height of

about 6,000 feet where the crop can be properly grown during the rainy season and good seed sent out to growers for eventual distribution to the plains. This year an Agricultural Officer was deputed during the seed potato season to Darjeeling and he examined all consigments of seed sent to agricultural officers, government farms, and agricultural associations.

Manures.—The use of bone-meal as a manure for transplanted paddy is appreciated, and would be used on a much larger scale if distribution difficulties could be overcome and the manure could be made available to the cultivator in good time and at a reasonable price. The demand for castor cake as a manure for cane and potatoes is increasing. The practice of green manuring for paddy is becoming popular among the cultivators of Western Bengal.

Irrigation Experiments.—This subject is one of increasing importance in many parts of Bengal and is receiving considerable attention. A farm has already been established at Bankura, and irrigation experiments will be started there as soon as it is fully equipped. In Bankura, Midnapore, and Birbhum a number of small irrigation societies on a co-operative basis have already been opened, and it has now been proposed to assist the movement by appointing an Irrigation Officer who will be in a position to advise the local societies on the most suitable sites for irrigation works and help them with plans and estimates. The Department has been carrying out detailed irrigation experiments during the last two years with the object of ascertaining in what tracts irrigation is most likely to be required and what will be the increased value of irrigation over dry crops.

Methods of lifting water are also being investigated and it is proposed to put down tube-wells at selected places with the object of experimenting with these wells as a source for irrigation. An oil engine pumping plant has also been established at the Berhampore Farm as a demonstration.

Agricultural Associations and Co-operation in Agriculture.—Agricultural associations have been in existence in many parts of the province for a good many years past. Some of them have done excellent work, but the majority have not proved altogether satisfactory. With the idea of remedying this state of affairs a movement has been started to organize Co-operative Agricultural Associations. Six of these associations have so far been organized in the Pabna district and registered under the Co-operative Societies Act. They raise their own share capital, and their main object is the raising of seed of new varieties of crops and the purchase and sale of special seeds and manures to their own members and also to outsiders. Progress is being carefully watched, and if they succeed, these associations should do a great deal towards rapidly and efficiently introducing agricultural improvements.

Satisfactory progress has also been made in co-ordinating the work of the Agricultural and Co-operative Departments, and there is much closer association between these two Departments now than hitherto.

Agricultural Activities of the Khas Mahal and Court of Wards' Estates and District Boards.—The Khas Mahal and Court of Wards' Estates continued to offer help in popularizing the use of improved seed, manures, and implements. Some of them also maintained their own officers. The Khas Mahal Farm at Jessore and the Wards' Estate Farms at Paiker (Bogra), Brahmanbaria (Tippera), and Bhowal (Dacca) did particularly useful work. In the Kalimpong Government Estates much good work was done in demonstrating improved methods of manure conservation, in the distribution of new seeds, such as maize, cane, etc., and in the establishment of a fruit industry.

District Boards in places also employed officers of their own to carry out demonstrations. The number of private farms established by zamindars and others has increased during the year, particularly in the Rajshahi Division. These farms are of assistance to the Department in many ways, notably in demonstration work and in the production of seed.

Agricultural Shows.—Twenty-one exhibitions were held in different parts of the province, to which grants-in-aid amounting to Rs. 3,000 were made. Almost all the shows were attended by the officers of the Department with collections of exhibits, including seeds, manures and implements. In

some of the important exhibitions the use of improved implements were demonstrated and lectures on agricultural subjects were delivered, whilst assistance was given in judging exhibits.

It was decided to try the experiment of holding agricultural exhibitions on the departmental farms instead of the usual system of holding them in the middle of the towns. Two such exhibitions were held on the Mymensingh and Pabna Farms respectively and were so successful in attracting the genuine cultivators and in creating interest in the work of the Department, that the system should be adopted where possible in the future.

Provincial Board of Agriculture.

The second Annual Conference of the Board of the Agricultural Department was opened by His Excellency the Governor on the 1st August at Dacca and lasted for two days under the presidency of the Hon'ble Minister for Agriculture. It was attended by a large number of visitors from all parts of the Presidency.

The Board has since been reconstituted on a more popular and representative basis and now consists of both official and non-official members, with the Director of Agriculture as President. It has been decided that meetings are to be held quarterly in future.

SECTION II.—SERICULTURE.

The Sericultural policy hitherto has been to produce disease free seed at the Government nurseries for sale to private rearers at the best rates obtainable. It is probable that during the last few years these nurseries have produced about 18 or 20 per cent. of the seed required, and the excellent prices obtained were an indication of the high reputation held by the Government seed. It appeared obvious however that Government could never expect to produce all the seed required by the professional rearers and that it would be necessary to call a halt very shortly. It was decided therefore to re-examine the policy, and in February I accompanied the Hon'ble Minister of Agriculture on a visit to the chief sericultural areas of the province with a view to discussing the situation with the actual rearers and others interested in the development of the industry. In March as a result of this tour the Hon'ble Minister decided to hold a Conference to discuss the question, at which not only the Members of the Bengal Silk Committee but other gentlemen interested in the industry were invited. As a result of this Conference it was agreed that our line of work in future should be to organise the private seed-producing system so as to act as an intermediate agency between the government nurseries on the one hand and the commercial cocoon growers on the other. It was further agreed that government nurseries should not be regarded simply as commercial propositions, but that they should be utilised more for demonstration purposes and as a means of educating the professional rearer class. The resolutions arrived at by this Conference are now under the consideration of Government.

Staff.—Mr. P. C. Choudhury, the Deputy Director of Sericulture, held charge of the general section as well as of the research side. In the former branch he was assisted by two Superintendents of Sericulture. Miss Cleghorn continued her scientific work on silk-worms at Alipore.

The sericultural staff has, up to the present, mainly been on a temporary basis, and a scheme for the reorganisation of the subordinate establishment of this section has been drawn up by me and is now under the consideration of Government.

District work.—The work of silk production on the seven government nurseries was continued, and the total sales amounted to Rs. 79,381 as against Rs. 77,286 in the previous year. The total expenditure was Rs. 1,62,460 against Rs. 1,40,460.

During the year an attempt was made to revive the silk industry in Bogra district. An investigation was first made and it was decided to reopen work

on a modest scale at the old government nursery which had been abandoned a few years ago. Local rearers were also provided with a number of mulberry cuttings, and the prospects so far appear to be promising. In the same way an investigation was carried out in the districts of Bankura and Birbhum, and it is hoped to be able to do something to revive the industry in those parts also. A small rearing house has been opened on the Dacca Farm mainly for instructional purposes. The Deputy Director of Sericulture has also commenced enquiries into the prospects of Tassar and Eri silk. One of the most important branches of the industry is the cultivation of mulberry, and a definite series of manurial tests on this crop were taken in hand for the first time during the year under report.

Cross-breeding Experiments.

The Berhampore Central Nursery has up to the present been reserved for carrying out experiments with cross-bred races. Some of these have seemed promising on a small scale, but when subjected to a field test under village conditions none have so far given really satisfactory results. The indigenous races possess great advantages on account of their hardiness and adaptability to local conditions. Work on the hybrid races will be continued but on a smaller scale, and definite attempts are now being made to improve the indigenous races by a system of intelligent selection.

Miss Cleghorn continued her work on the inheritance of characters in silk worms and also her researches into mulberry. The results obtained will be found in detail in her report.

Sericultural Education.—There seems to be an increasing demand for sericultural education throughout the silk-growing areas The two existing schools are not quite adequate to meet the present situation. There is an opening for a sericultural school at Malda, but the whole question of sericultural education is now under the consideration of Government. Five boys passed from the Rajshahi Sericultural School and three of these were given the usual reward for the erection of model rearing houses. Training in the principles of sericulture was also given to the sons of professional rearers at the primary schools which have been opened in connection with the Government Sericultural Nurseries at Piasbari and Amriti in the Malda district.

SECTION III.—MISCELLANEOUS.

Statistical.—No new returns were initiated during the year.

A new edition of the manual of rules for the preparation of Crop Reports and Agricultural Statistics was compiled with the object of bringing up to date all the orders of Government now in force relating to the various statistical reports and returns.

Rainfall.—During the year one new rain-registering station was opened, making a total number of 245 in the Presidency.

Financial.—The receipts and expenditure of the Department for the year 1921-22 as furnished by the Accountant-General, Bengal, are detailed below :—

Receipts.	Rs.	A.	P.
Receipts on account of experimental cultivation	84,470	8	1
Jute	1,274	7	0
Paddy	140	0	0
Sericulture	49,425	11	3
Receipts on account of Public Exhibitions and Fairs	190	11	0
Total ...	1,35,501	5	4

Expenditure.	Rs	A.	P.
Superintendence	80,165	9	5
Expert staff (other supervising staff)	4,14,058	7	1
Experimental Farms ...	1,86,847	9	2
Agricultural Experiments ...	35,221	13	10
Seed Stores	17,991	6	2
Agricultural Schools	22,145	11	11
Sericulture	2,22,379	15	3
Public Exhibitions and Fairs ...	3,100	14	9
Total ...	9.81,911	7	7

Publications.—The Quarterly Journal of the Department in its new form is increasing in popularity. The annual subscription (includes the increased

postage rates) has been raised to Rs. 2-12 for the English and Rs. 1-12 for the Bengali edition.

Besides the journal, the Department published as usual several bulletins and leaflets in English and Bengali.

Acknowledgment.—I wish to take this opportunity of expressing my obligation to the large number of Government officials and private individuals, who have helped the Department during the year. It was largely on account of their active and sympathetic support that it was found possible to carry on the extensive programme of the Department. I am also greatly indebted to the Imperial Officers at Pusa for their valuable assistance and advice.

Staff.—Despite the pressure of increased work the staff as a whole worked with zeal and energy. Mr. Finlow was on leave during the greater part of the year and his absence from the Fibre Section was naturally felt. My congratulations are due to Mr. G. P. Hector for the excellent progress he has made in his botanical studies on paddies. His work in this respect has recently met with due recognition by the award of the degree of Doctor of Science by his old University. Mr. M. Carbery has made an excellent start and has started some important original researches. His work as Honorary Editor of the Quarterly Journal also deserves special mention. Messrs. Dwijadas Dutta and Jadu Nath Sarkar have set themselves earnestly to work in order to acquire the requisite experience and knowledge of their respective charges. The confirmation of Babu Bhabatosh Dutt as Superintendent of Agriculture and Babu Surendra Nath Bose as Superintendent of Sericulture and the promotion of Babus Nirmal Chandra Basu, Gosto Behari Pal and Mr. S. G. Sharangapani to the Provincial Agricultural Service were amply justified. Finally I desire to place on record the loyal and ungrudging assistance of my office staff who worked under very arduous conditions throughout the year. I wish particularly again to call attention to the services of my Personal Assistant, Mr. Jyotis Chandra Roy.

APPENDIX I.

REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, WESTERN CIRCLE, FOR THE YEAR 1921-22.

Introductory.

This Circle comprises the six districts of the Burdwan and five districts of the Presidency Division.

Charges and Tours.

Mr. Smith was in charge of the Circle till the 16th May. I took over from him on the 17th and have been in charge since.

Mr. Smith was on tour for 23 days and myself for 150 days during the year.

Staff.

There are two Superintendents of Agriculture in charge of the two Divisions. The number of District Agricultural Officers and Demonstrators in the Circle are distributed as follows :—

Burdwan Division.

	District Agricultural Officers.	Demonstrators.	
		Permanent.	Temporary.
Howrah	1	2	..
Hooghly	1	2	...
Burdwan	1	4	...
Midnapore	2 (1 at Sadar and 1 at Ghatal.)	4	...
Birbhum	3 (Sadar 1, Bolpur 1 and Rampurhat 1.)	7	9
Bankura	2 (Sadar 1 and Bishnupur 1.)	5	1

Presidency Division.

24-Parganas	1	5	...
Gosaba	1	...	...
Nadia	2 (1 at Sadar and 1 at Meherpur.)	5	...
Murshidabad	1	4	...
Jessore	1	5	...
Khulna	1	3	...

Besides these, one Agricultural Officer was entertained at Serampore up to the 10th January 1922, and another at Arambagh up to 31st July 1921 by the District Board of Hooghly, but these posts have since been abolished. The following District Boards maintained Agricultural Demonstrators as shown against each :—

Burdwan	3
Midnapore	6
Hooghly	2

For the jute forecast work 32 men were employed for a period of four months (15th May to 15th September).

Season.

The season was, on the whole, unfavourable for both *kharif* and *rabi* crops. The monsoon has unusually late, which delayed transplantation of paddy all over and the want of rainfall from September to November seriously damaged all crops. The *rabi* crops also greatly suffered owing to absence of cold weather showers.

Agricultural Stations.

There are only two farms in the Circle, one at Chinsura and the other at Burdwan. Work has also been started, in a modest way, on the Berhampore Farm; for want of funds, however, the construction of buildings in this farm has not been taken up. In the Bankura Farm, the construction of buildings is in a fair way to completion, and if funds are available, work will commence from the next monsoon. At Birbhum it has not been possible to do anything for want of funds.

The want of a Divisional Farm is being keenly felt in the Presidency Division. Several sites have been inspected in the Sadar and Barrackpore Subdivisions and a final decision will be arrived at on receipt of a report from the Superintendent of Agriculture, Presidency Division, who has been directed to submit it after visiting the Khas Mahal land in the Barrackpore Subdivision.

Chinsura Farm.

In the Chinsura Farm during the year under report, a total area of 159 acres was under cultivation and experiments were undertaken with a variety of crops and manures in order to test their suitability for clay loam soils, as also for producing improved seeds for distribution. The monsoon was very late and short with no showers after October. The year was therefore totally unfavourable for *aus* and *aman* paddies, as also for *rabi* crops. The utter absence of any rains between January and March will seriously affect next year's cultivation also, inasmuch as all preparation of land has been delayed. The necessity for irrigation arrangements is becoming more and more apparent and imperative. Pure-line cultures and trials under the Economic Botanist expanded considerably during the year and selection work on cotton was taken up. *Dudsar* has been found to be a good heavy yielding *aman* paddy. Definite results, achieved during several successive years, conclusively show that *dhaincha* green manuring on *aman* paddy gives the best result. Experiments will now be conducted to find out whether an additional dose of phosphate would increase its value further. There was a great demand for cuttings of Yellow Panna canes and measures have been taken under instructions from the Imperial Sugar Bureau for rapid reproduction of the crop, as practised in Java, with a view to ensuring an increased supply next year. Pusa wheat Nos. 4 and 12 were found quite suitable and to be the best yielders, the former ripening rather earlier. The outturn of wheat from irrigated area was nearly double that of the non-irrigated area. Trials with a Midwest Motor plough were started towards the close of the year, and it was observed that this form of tractor can work on plots of 5—7 cattas and can skip over ordinary *ails* (field boundaries). The entertainment of apprentices has been abolished this year in view of the starting of the Secondary Agricultural School on the farm. The farm office and the godown need further extensions and the want of an inspection room is keenly felt. A Provincial Officer has been put in charge of the farm since 29th November 1921, with the designation of the Chief Farm Superintendent, with a view to ensuring greater efficiency.

Burdwan Farm.

This farm, which is the oldest farm in Bengal, has been conducted up to date at the expense of the Hon'ble Maharajadhiraja of Burdwan. It was made into a departmental farm from October 1921, with the object of utilising it as a District Demonstration Farm. The deficient rainfall in October and the complete absence of showers from November to March made conditions unfavourable for winter paddy, cotton and *rabi* crops. The local *Newali aus* has for two successive years given better results than *Kataktara* paddy, and the trial will be repeated more systematically so as to arrive at definite conclusions. *Jhingasal*, *Jatakalma* and *Nagra* varieties of *aman* paddy, big Japanese groundnut and white Comilla *Rahar* were grown during the year. The farm badly needs fencing, a separate office and a rat-proof godown. It may be noted here that the physical conditions of this farm are not very suitable for experiments.

Berhampore Farm.

A district farm was started at Berhampore (Murshidabad) in August 1921, with the object of (1) conducting varietal demonstrations of departmental and local seeds, (2) conducting irrigation experiments on *rabi* crops, (3) manurial and other experiments on sugarcane and (4) demonstrating the utility of a power pumping plant. Only 6·1 acres of land could be reclaimed during the year under report and hurriedly put under *rabi*

crops. The effect of irrigation on wheat was well marked and the suitability for other *rabi* crops observed. The Industries Department will soon put up a pumping plant as a demonstration.

The Gosaba Farm.

In the Sundarbans is owned by Sir Daniel Hamilton, Kt., the management being in the hands of the Department. The main object is to experiment and demonstrate on the suitability of other paying crops, besides paddy and on the methods suitable for the Sundarbans. Paddy transplanting was delayed for want of timely rainfall and a severe high tide (21 feet 6 inches) in August seriously damaged the crop. It was observed that sugarcane got stunted and that cotton and groundnut would not thrive well on saline soils. *Rabi* crops, however, promised a partial success, but no recommendations can be made without further trials. A permanent fencing for the protection of experimental and demonstration crops from the ravages of wild animals and stray cattle is urgently necessary. Arrangements for storing water for irrigation by digging ditches, etc., are also essential for saving crops from drought, and some high land plots are also necessary.

Agricultural Education.

1. The Chinsura Vernacular Agricultural School, which was started in February 1921, continued its existence till 31st December 1921. There were 12 students at the time, 6 Hindus and 6 Muhammadans. The boys cultivated 8 bighas of *aman* paddy and some *rabi* vegetables with success. They also raised some fruit trees with success. At the annual examinanion the examiners reported that the boys had made good progress within the short time.

This vernacular school has since been converted into a Secondary Agricultural School. There are now 11 students (7 Hindus and 4 Muhammadans) in the first year class and 10 students (5 Hindus and 5 Muhammadans) in the second year class. An additional assistant teacher has been appointed since February last for training the boys in carpentry and smithy. A temporary shed has been erected for the workshop. A tube well was sunk with great success near the hostel towards the close of the year to provide drinking water for the school. This well is giving excellent water. The sanctioned and other pending projects of the school need immediate provision of funds for early execution. Delay in the construction of buildings is hampering the efficient working of the school.

2. The Amarpur Agricultural Institute was started at the instance, and with the munificent gift of Babu Monmotha Nath Pal of Amarpur (Burdwan) in 1919-20. Agricultural instructions, both in theory and practice, were given to the two top classes of the Middle English School, and practical farm work, as far as possible, done under the guidance of an Agricultural Officer placed there by the Department. The farm badly needs fencing as all crops were more or less damaged by cattle and goats. There were 39 boys altogether under training during the year and 26 of them passed the examination.

Demonstration work.

Brudwan Division.

1. Bonemeal on *aman* paddy in the laterite soils of Bankura, Birbhum, Burdwan and Midnapore has given good results as usual, with an average increased outturn of about 2 maunds per bigha.

2. Green manuring of transplanted winter paddy with *dhaincha* is becoming more popular and the demand for supply of *dhaincha* seeds is increasing.

3. For the high waste lands of Bankura, Birbhum, Burdwan and Midnapore groundnut has been found to be a successful crop, but the introduction of early varieties is urgently necessary as the cost of lifting a late crop leaves very little margin of profit.

4. Selected varieties of departmental paddies, viz., *Indrasail*, *Kataktara* and *Nagra* have kept up their reputation.

5. The demand for *Tanna* sugarcane cuttings is as keen as before, but complaints are received here and there about the quality of its *gur*, as giving an acid taste and being a bad keeper.

6. The use of castorcake as a manure for sugarcane and potatoes is becoming more and more popular.

7. Pusa wheat has given good results in Birbhum, Bankura, Burdwan, Midnapore and parts of Hooghly.

Presidency Division.

Owing to the paucity of the staff demonstration work could not make as much headway here as in the Burdwan Division.

The following results of demonstration may, however, be noted :—

Kataktara aus has given good results in Nadia and in the Sadar subdivision of Murshidabad ; and bonemeal and *dhaincha* in the Kandi subdivision of the Murshidabad district.

Excellent results have been obtained in Khulna with the departmental jute seeds (Chinsura green and R. 85).

Tanna sugarcane has given good results in 24-Parganas and in portions of Murshidabad ; and Darjeeling potato has given good results in the Nadia district.

The results of irrigation demonstrations with Pusa wheat at Murshidabad as reported by the District Agricultural Officer and as given below, will be found interesting :—

Centres.	Gangajali (irrigated).	Pusa 12 (irrigated).	Gangajali (dry).	Pusa 12 (dry).	Remarks.
Abgaon—	Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.	
1st year ...	3 10	4 0	3 7	3 0	Per bigha.
2nd „ ...		Not harvested yet.			
Gulatia—					
1st year ...	4 5	4 21	3 12	3 2	
2nd „ ...		Not harvested.			

It is also evident from the above results that under droughty conditions, when there are no facilities for irrigation, Gangajali (the local variety) is hardier than the Pusa and gives a better outturn. Under irrigated conditions, however, the Pusa variety is decidedly a much heavier yielder.

Distribution of seeds and manures.

During the year under report the following approved seeds and manures were distributed :—

Burdwan Division, including Chinsurah Farm,

	Mds.	Srs.
(1) Kataktara aus paddy	276	9
(2) Nagra paddy	219	2
(3) Indrasail paddy	119	36
(4) Jute	20	10
(5) Cotton	32	20
(6) Tanna cuttings	107,500	setts.
(7) Dhaincha	224	0
(8) Bonemeal	371	0
(9) Castorcake	275	0
(10) Groundnut	22	0

Presidency Division.

	Mds.	Srs.
(1) Kataktara	98	0
(2) Nagra	9	0
(3) Indrasail	20	24
(4) Jute seeds—		
Capsularies	27	20
Olitorious	0	5
(5) Cotton	22	37
(6) Sugarcane cuttings	11,000	setts.
(7) Dhaincha	56	22
(8) Bonemeal	56	22
(9) Castorcake	241	30
(10) Wheat	13	30
(11) Comilla rahar	2	25
(12) Groundnut	56	22

Private seed farms.

With a view to supplement the work of seed supply by Government stores and farms the establishment of private seed farms under departmental supervision is of supreme importance. During the year under report this scheme received some impetus, and it is hoped that, with proper encouragement, many such farms will be established in the near future. The farms of Rai Bahadur K. N. Mullick of Ranaghat, Babus B. N. Banarji of Harbaradi, Gopendra Nath Banarjee of Jamsherpur, Mr. Smith's Farm at

Dadpur, the farm of Messrs. Anderson Wright & Co., of Ramnagar, of Babu Basanta Kumar Mitra of Panisehala, the Nadia Farm of Babu Aghore Nath Mukherjee and that of Babu Surendra Nath Sen of Chandrakona Road are good grounds for working out this scheme and deserve special mention.

Agricultural Associations.

In the Burdwan Division, there are no less than 220 Agricultural Associations and large quantities of seeds and manures were supplied through them. In Birbhum 68 tanks were re-excavated for irrigation purpose by these associations and as an instance of their splendid activity it may be noted that they purchased, during the year under report, about 350 maunds of seeds and 600 maunds of manure of different kinds. The Bankura and Midnapore Branch Associations also purchased 43 maunds seeds and 700 maunds manures and 138 maunds seeds and 95 maunds manures, respectively The report of the Birbhum District Association is a record of valuable work done during the year.

In the Presidency Division the Khulna District Association is maintaining a small demonstration garden and the Murshidabad Association maintains a whole-time Demonstrator. The Nadia District Association and the Subdivisional Associations are all doing useful work. At Baraset the 24-Parganas District Association has recently provided funds for a small sugarcane area for multiplication and supply of improved sugarcane cuttings to growers. This Association is doing other useful work also.

Khas Mahals.

During the year under review commendable interest was shown by the Khas Mahal authorities in agricultural improvements.

The Khas Mahal of Howrah has provided Rs. 500 for agricultural improvement and an elaborate programme has been drawn up, including the distribution of 20,000 tanna cuttings and the re-excavation of a tank for irrigation. A Fieldman Demonstrator has also been appointed by them.

In Midnapore also a demonstrator was maintained throughout the year.

In Jessore, a small farm has been started by the authorities for demonstration and multiplication of seeds and through the cordial co-operation of the Khas Mahal authorities considerable success has been achieved within a comparatively short time.

For the improvement of agriculture in the Khulna Khas Mahals the Commissioner of the Presidency Division sanctioned a sum of Rs. 700 and *Kataktara aus* seeds Yellow tanna sugarcane cuttings and *rabi* seeds have been distributed to the Khas Mahal tenants with this money.

The Sayedpur Trust Estate has also done good work in the district. A demonstrator was also maintained by the estate for five months for the timely distribution of seeds.

Wards Estate.

The Jhargram Wards Estate in Midnapore demonstrated seeds and manures recommended by the Department with success.

District Boards.

The District Board of Hooghly maintained two Agricultural Officers at Arambagh and Serampore for a considerable part of the year and two Demonstrators throughout the year. For want of funds the services of the Agricultural Officers could not be retained.

The District Boards of Burdwan, Midnapore and Hooghly maintained 2, 6 and 2 Demonstrators respectively.

The District Boards of Birbhum and Bankura spent Rs. 2'0 and Rs. 500 respectively for agricultural improvement during the year under review. These amounts were spent in distributing seeds and manures at concession rates, printing of leaflets and on demonstrations at exhibitions.

Exhibitions.

Exhibitions were held at Suri, Hetampur and Bankura in the Burdwan Division and at Gobardanga, Baraset and Kesherpahar in the Presidency Division, in all of which considerable interest was evinced in agricultural demonstrations.

Irrigation Societies.

The problem of irrigation is the chief problem in the agriculture of Western Bengal districts, and it is a matter of satisfaction that the cultivators of Birbhum, Bankura and Midnapore are earnestly trying to solve this by forming irrigation societies on a

co-operative basis. These societies have taken up the re-excavation of tanks and are also digging canals, using the sluice gate system to regulate the inrush of water. In the Bankura District 13 such societies have been started and 13 are under contemplation. In Midnapore one society has already been formed and in Birbhum three are under contemplation. The work of the Khela society in the Midnapora district has been so successful in this respect that lands which formerly yielded 4 to 5 maunds of paddy are now yielding from 8 to 10 maunds per bigha. This is a splendid example of self-help and co-operation. As, however, the raiyats are poor some sort of State aid is necessary to encourage them in their endeavours.

Agricultural Survey.

The Agricultural Officers of this Circle are studying local conditions and attending to a preliminary agricultural survey of the districts, as required by the Hon'ble Minister. A few thanas have already been surveyed and the Superintendents of Agriculture will now be asked to check the notes.

R. Das Gupta,

Deputy Director of Agriculture,
Western Circle, Bengal.

APPENDIX II.

REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, EASTERN CIRCLE, FOR THE YEAR 1921-22.

The Eastern Circle comprises the two Divisions of Dacca and Chittagong.

Tours and Staff.

I took over charge from Mr. K. McLean on the 24th of May 1921. He toured 11 and I was on tour 158 days during the period under review. I visited and inspected every district and most Demonstrators.

Rai Sahib J. K. Biswas and Mr. H. P. Mitra were Superintendents of the Dacca and Chittagong Divisions and were on tour 230 and 104 days, respectively, during the year. Their headquarters are at Dacca and Chittagong.

Agricultural Officers were employed at Dacca (290), Narayanganj (250) Mymensingh (135), Kishoreganj (225), Jamalpur (151), Faridpur (186), Barisal (100), Tippera (155), Noakhali (168) and Chittagong (111) and toured according to the number of days bracketed against each centre. Recently a Demonstrator was appointed to the Chittagong Hill Tracts at Rangamati along with 2 Demonstrators for district work.

The following table gives the number of Demonstrators and jute clerks maintained by this Department, Khas Mahal and Court of Ward's Estates, district by district, during the year :—

District.	Demonstrators maintained by Agricultural Department.	Government farms.	Jute clerks.	Khas Mahal Farms and Demonstrators.	Court of Wards' Farm and Demonstrators.
Dacca ...	11	1	5	.....	1 Farm, Joydebpur.
Narayanganj ...	6	...	4	.....	.....
Mymensingh ...	7	1	7	1 Demonstrator ...	1 Demonstrator, Santosh.
Jamalpur ...	3	...	5	.....	.....
Kishoregani ...	3	...	4	.....	.....
Faridpur ...	10	...	10	.....	.....
Bakarganj ...	6	1	9	8 Demonstrators, 7 gardens.	5 Demonstrators.
Tippera ...	6	1	4	.....	1 Farm, 2 Demonstrators
Chittagong ...	7	...	nil	1 Demonstrator ...	Sarail 1 Demonstrator. Sitakund.
Noakhali ...	6	..	3	3 Demonstrators ...	.....

The Dacca, Comilla and Chittagong District Boards supplied us with seed stores at Munshiganj, Narsingdi, Brahmanbaria and Fatickchuri during the year free of rent.

The Bhowal Estate not only maintained a farm at Joydebpur, but 4 seed stores in the district of Dacca at Joydebpur, Kapasia, Sabhar and Kaliganj.

The Sarail Wards Estate at Brahmanbaria opened a farm during the year. They also maintained 2 demonstrators.

The Khas Mahals in Bakarganj maintained 7 Gardens and 8 Demonstrator while the Court of Ward's in Bakerganj maintained 5 demonstrators.

The Nawab of Dacca's Estate has recently decided to collaborate with this Department in introducing improvements.

The Khas Mahals in Noakhali maintained 3 demonstrators and demonstrated Tanna sugarcane in Sandwip, Hatiya, and Noakhali.

The Durgapur High School at Mirsarai in Chittagong maintained a small farm during the year.

Farms.

The Dacca, Mymensingh and Comilla Farms were continued and the Barisal farm was opened during the year, all maintained by this Department. In addition two useful farms were opened by the Bhowal Raj and Sarail Ward's Estate at Joydebpur and

Brahmanberia, respectively. We also started a demonstration plot at Dhanbari in Mymensingh. The Durgapur High School maintained a little farm in connection with their school at Mirsarai, Chittagong.

Dacca.

This farm is the headquarters of the whole Department and expenditure is high owing to the fact that we have to carry out experiments for the Fibre Expert and Agricultural Chemist and supply bullocks and men to first and second Economic Botanist and repair the houses and huts of all the laboratory staff and the daily labour on the farm. The labour supply also is very costly for carrying out the necessary experimental work when the weather permits. The scindi breed of dairy cattle did well during this year, but it is too early yet to draw conclusions as to their suitability for our damp climate.

Comilla and Mymensingh Farms continued their work, but they have not yet returned to equilibrium from their laying out operations. High land has been arranged at Comilla. Barisal Farm grew good crops of *aman* paddy although started late in the year, and this year should see work in full sowing.

Faridpur, Rangamati and Chittagong Farms only require funds to erect the necessary buildings. When this is done three more good centres of activity of our Department will have been provided. The Feni Farm site has not yet been decided. Reports of these farms should be consulted for details.

District work and Demonstration work.

The main work of the year has been the consolidation of the work in hand and the co-ordination of the present district staff. Demonstrators have not been checked enough in the past and were consequently out of touch with us. They were not provided with the necessary seed store office and working facilities, with the result that in many cases they were a forlorn set of people who seemed more like pensioners than active workers, who should be the very backbone of the Department. The outstanding Agricultural Officers who controlled and had their demonstrators constantly in touch with them were Babu D. N. Mitra, of Faridpur and A. L. Shome, of Kishoreganj.

The main features of demonstrations were K. B. jute, *Kataktara aus* paddy and *Indrasail aman* paddy, Chinsura green jute (a bogi variety), *tanna* sugarcane, potatoes, tobacco and vegetables.

For details see Appendix on District Demonstration Work.

K. B. Jute seed.

The demand for this variety is greater than the supply at present. Cultivators willingly pay eight annas a seer for this seed when locally they can purchase seed at four annas. Th eguaranteed germination of Fibre Expert's seed is well appreciated by raiyats. Last year we sold to all the districts about 800 maunds and this year about 600 maunds have been sold. I have no hesitation in saying double this quantity this year could have been sold. Seed must be supplied in good time when there will be no risk. This opens out a great field of activity for seed production in Bengal, for nearly all this seed so far has been grown in Assam and Bihar, and it means that we can do always with Rs. 40,000 worth of jute seed per annum regularly.

Chinsura green jute seed.

The demand for this variety at Re. 1 per seer is greater than we can supply.

Kataktara aus paddy and *Indrasail aman* paddy.

There is a fair demand for both these varieties, and the position is far healthier than it was now that we have insisted on cash payment. Of course, these varieties are well distributed throughout this Circle. but unfortunately cultivators get their seed mixed and Agricultural Officers are required to bring in fresh seed annually from the farms to maintain the standard of purity.

Sugarcane.

Tanna sugarcane is now very popular. All the farms and especially the Dacca Farm supplied a number of cuttings this year.

The Agricultural Officer of Kishoreganj, Babu Amrita Lal Shome, is to be congratulated on having sold to local cultivators over one lakh of cuttings.

Potatoes.

Cultivators of this Circle have very much to learn about this crop. They are satisfied with 15—20 maunds of tubers per bigha or 45—60 maunds per acre and don't think of irrigating or applying castorcake as a manure. Clever Serampore cultivators, on the other hand, apply 10 irrigation and 7 to 10 maunds of castorcake per bigha and obtain yields of 60 to 80 maunds of potatoes per bigha or 200 maunds per acre.

My recommendations for this crop for the Eastern Circle are first grow in 18 inches rows, not in 36 inches rows and thereby economise labour, water and manure.

Secondly apply 7 to 10 maunds of castorcake per bigha.

Thirdly irrigate at least two or three times from *cutcha* wells and oftener, if necessary.

The Agricultural Officer, Kishoreganj, is further to be congratulated on arranging a good supply of seed at the right time through local merchants without any departmental finance.

D. N. Mitra, Agricultural Officer, Faridpur, also arranged the financing of seed potatoes by local zamindars.

Tobacco.

Rai Sahib J. K. Biswas, Superintendent of Agriculture of the Dacca Division, arranged a good many demonstrations of Sumatra and Motihari tobaccos.

Vegetables.

These crops—cabbages, cauliflowers, beet, turnips, peas, onions and French beans—are becoming popular everywhere and the demand is ever increasing. We are supplying good seed and seedlings.

Agricultural Associations.

Agricultural associations exist only in name in the Eastern Circle. One searches in vain for a corporate body with an energetic practical Secretary who collects subscriptions and money to finance work in collaboration with this Department on the lines of Birbhum Agricultural Associations.

We should like to see the spirit of self-help more developed with local people doing definite work and co-operating with our officers more than at present. In fact, wherever there is a Demonstrator there should be a local agricultural association.

It is proposed to employ co-operative methods with these associations, but unless some intelligent practical workers come forward to inaugurate, consolidate and push on local effort very little progress will result. Faridpur, for example, with 49 so-called agricultural associations, means very little, but Faridpur with a Central Agricultural Association or District Agricultural Association and nine village agricultural associations affiliated, *i.e.*, one for each Agricultural Demonstrator to supervise, would soon be able to formulate programmes of work, collect subscriptions and let local people know what is being done and where local people could get definite information.

Agricultural Education.

The Vernacular Agricultural School on the Dacca Farm finished its two years' course in December 1921 and it was found that most of the boys who had joined, had come only for service and not to go back to the land. The progress the boys made in the second year was phenomenal. From boys steeped in prejudice and caste we had trained boys to use their hands and value the dignity of labour.

This school has now been turned into a Secondary Agricultural School where men are being trained as demonstrators and also as teachers in the proposed village agricultural schools. Thirty-three young men are now being trained, and with care and attention 16 of them should be ready for district work in December 1922.

The Durgapur High English School at Mirsarai, Chittagong, continues its agricultural classes and maintained a small farm, but the agricultural side of such a school will never be popular as the be-all and end-all of such a school is Matriculation which leaves no time for agriculture. However, this school maintained an agricultural trained teacher throughout the year and those boys who desired could spend more time on agriculture. The farm proved a useful demonstration centre.

Agricultural Shows.

A very useful agricultural show was held on the Mymensingh Farm in January. It was popular and attracted a great number of people. Good practical demonstrations were given on the Dacca Farm at the meeting of the President Panchayets' Conference in February at which His Excellency Lord Ronaldshay presided. A *mela* was held at Quepara in Raojan, Chittagong, which we supported and a very useful little show was

held at Munshiganj during the year under report. Good useful practical shows can be held at the farms at very little expense. The dates should be fixed at least three months beforehand, and local zemindars and gentlemen, District and Union Boards should be asked to co-operate. With a representative committee selected from these bodies in plenty of time a very useful practical agricultural show can be held on any of the farms for Rs. 400 or so. Prizes can be awarded and light refreshments and simple amusements offered.

Khas Mahals and Court of Wards' Estates.

Bakarganj has the biggest programme of work in hand, in fact with 7 gardens and 8 demonstrators maintained by the khas mahals and 5 demonstrators by the Court of Wards the work is too much for the Agricultural Officer to supervise in addition to his farm and district work. An extra Agricultural Officer should be appointed immediately to supervise the work of khas mahals and Wards' Estate.

Merits of Officers.

Rai Sahib J. K. Biswas, Superintendent of Agriculture, Dacca, worked with energy. He should, however, watch expenditure more closely and get to know his demonstrators better.

Mr. H. P. Mittra, Superintendent of Agriculture, worked carefully, but he is not blessed with good health. He should get to know his demonstrators better.

Babu T. N. Roy, Chief Superintendent, Dacca Farm, worked laboriously and well on the Dacca Farm. All Agricultural Officers worked well, particularly D. N. Mitra of Faridpur, A. L. Shome of Kishorganj and S. N. Sen of Backerganj. Munshi Abdul Jalil and the Overseers worked well on the Dacca Farm. Many demonstrators unfortunately were unsatisfactory. They require more attention from both the Agricultural Officers and the Superintendents of Agriculture.

Acknowledgments.

I wish to record my thanks to T. Emerson, Esq., Commissioner of the Dacca Division and J. Clayton, Esq., Commissioner, Chittagong Division, for the great help they gave us with Khas mahals and Court of Ward's estates. All Collectors gave us every help and particularly I must record the help given to this Department by Mr. R. Needham of Joydebpur and Mr. M. M. Halliday of Sarail Ward's Estate, Brahmanbaria.

The special thanks of the Department are due to Nawab Khajeh Yusuff Khan Bahadur, Khan Bahadur Syed Ahmed Hossain Chaudhury, Khan Bahadur Hemayetuddin Ahmed, Babu Kamini Kumar Roy, Khan Saheb Amanali Chaudhury, and the Chairmen of the District Boards, Dacca, Mymensingh, Bakarganj, Faridpur, Chittagong and Tippera and a host of other well wishers and supporters of this Department too numerous to mention.

F. SMITH,

Deputy Director of Agriculture, Eastern Circle.

APPENDIX III.

ANNUAL REPORT OF THE DEPUTY DIRECTOR OF AGRICULTURE, NORTHERN CIRCLE, FOR THE YEAR 1921-22.

Introduction.

The Northern Circle consists of the eight districts of the Rajshahi Division with an area of 18,071 square miles.

Character of the season.

Except in Rajshahi and part of Pabna the season was favourable for *kharif* crops and practically there was a good harvest of winter paddy. The rains were very late in Rajshahi and Pabna and consequently the crops were not very satisfactory. As there was no rain after the middle of October the *rabi* crops suffered a great deal.

Charge and Tours.

I was in charge of this Circle throughout the year and visited all the districts in the Circle spending 183 days on tour. Babu Bhabatosh Dutt was the Superintendent of Agriculture, Rajshahi Division, throughout the year and was on tour for 218 days. Among the District Agricultural Officers and the Farm Superintendents there were some changes within the Circle.

During the year under report 19 new Demonstrators were added to the permanent departmental list making a total of 32 Government demonstrators in the Circle.

Government Farms.

The Rangpur Cattle Farm and the Burirhat Tobacco Farm are the only farms of their kinds in Bengal, and particulars regarding the work done on them will be found in the respective annual reports.

The oldest farm in the Circle is at Rajshahi. Besides demonstrations, experiments with crops suitable for this locality, namely, paddy, jute, sugarcane, wheat and pulses, are being carried out under the direction of the experts. The bad effect of irregular and untimely rainfalls throughout the autumn and winter told heavily upon the success of the operations undertaken. It is hoped that some arrangements for irrigation will be made in near future. Without irrigation it seems rather impracticable to raise crops with success.

There are three district farms at Rangpur, Bogra and Pabna. The beautiful crop of D. 154 jute on the Rangpur Farm and the Chinsura green jute on the Pabna and Rajshahi Farms had been matters of discussions amongst the local people who are actually interested in agriculture.

Bogra Farm is situated on the Khear land. But the other side of the river Karatoa being alluvial, it has been settled to start a small farm there on soil typical of the tract and accordingly a site has been selected.

The land for two new farms at Dinajpur and Moynaguri (Jalpaiguri) has been acquired and a site for the new farm at Malda selected. It is hoped that during 1922-23 one or two of these farms will be started. Land for Dinajpur and Moynaguri farms has been provided by the District Board and Jalpaiguri Khas Mahal, respectively. The farm site of Malda will also, it is hoped, be provided by the District Board.

The Kalimpong Farm of the St. Andrew's Colonial Homes is a typical farm representing the soil and climatic condition of the Government Khas Mahals. Maize, kodo, buck wheat, soybeans, potato, fruits and vegetables are grown here. It was visited by the Director of Agriculture and the Deputy Director of Agriculture, Northern Circle, Rangpur, during the year.

Summary of works done during the year.

(1) Distribution of improved seeds raised by the experts.
(2) Introduction of new crops and better manures and implements.
(3) Irrigation experiments on *rabi* crops.
(4) Organisation of private seed farms.
(5) Organisation of agricultural association.
(6) Demonstrations in the district exhibitions.
(7) Experiments on selected crops in our farms as settled by the experts.
(8) Placing of half-bred Hissar bulls in some of our farms for breeding purpose.
(9) Demonstrations in the Khas Mahal and Wards Estates.
(10) Supply of seeds and manures from seed stores.
(11) Jute forecast.
(12) Agricultural survey.

The details regarding (1) above and the important centres of work in the Circle will be found from the Appendices A and B respectively attached to this report.

Distribution of Improved Seeds raised by the Experts.

Indrasail.

One thousand and eighty-four maunds and 20 seers of seed was distributed to the cultivators on condition of equal return. On realization the cultivators' seeds were found mixed; consequently they were disposed of and replenished by new seeds from Government farms.

On account of the danger of admixture in realization and the heavy cost incurred it will probably be found necessary to abolish the system of distribution on equal return.

Demonstrations conducted in cultivators' fields in different districts showed its superiority over local varieties; the increased outturn varied from 3 to 8 maunds per acre.

Kataktara Aus Paddy.

One hundred and seven maunds and 30 seers of seed were sold to the cultivators. It was in great demand in Rangpur, Jalpaiguri, Dinajpur and Malda. Demonstrations were conducted in all the districts except Darjeeling.

K. B. Jute.

Forty maunds and 20 seers of seed were disposed of. Its superiority over the local variety can be guessed from the heavy demand for the seed. To cope with the demand a good many seed farms have been organised. The district of Rangpur heads the list with 19 such farms and the Rajshahi district comes second with 12

Yellow Tanna Sugarcane.

This variety is making great headway in all the districts specially in Rangpur and Rajshahi.

It is very gratifying to note that in a single village in the neighbourhood of Rangpur town there were not less than 100 bighas under this variety. In the coming year the area is expected to be doubled. Over two lakhs of sets of sugarcane were supplied to cultivators in various districts during the year under report.

Wheat, Pusa No. 12.

This variety was tried in Malda, Rajshahi, Rangpur and Pabna. Everywhere it gave better results than the local varieties. In Rajshahi Pusa 12 gave an increased outturn of about 3 maunds per acre over Gangajali, the local wheat.

Sumatra Tobacco.

In 1920-21, the area under this crop fell to 10 acres; but it rose to 40 acres in this year. Probably the imposition of a new customs duty on imported tobacco gave an impetus to its cultivation. Some local cultivators of Rangpur are preparing cigars with profit under our direction. They receive training from the departmental demonstrators.

Groundnut.

It was first introduced in the district of Malda in 1919-20, where it was grown on 3 bighas only. The area rose in 1920-21 to 9 bighas and to 82 bighas in the year under report.

Manures and Implements.

Green manuring with *dhaincha* and bonemeal are gradually becoming popular manures for paddy cultivation.

The use of improved implements, namely, Meston plough, Hand hoe, cane-crushing mills and *gur*-boiling pans is gradually gaining ground. A few of these were disposed of.

Irrigation Experiments.

A series of experiments were undertaken in all the districts. In Rajshahi the irrigated plots under wheat gave an increased outturn of 3 maunds 26 seers per acre over the non-irrigated plots.

Organisation of private seed farms.

There are at present 42 private seed farms working in collaboration with us ; 27 of these are newly started during the year (Rajshahi 11, Dinajpur 4, Malda 7, Bogra 3, Rangpur 11, Siliguri 2 and Pabna 4). The following table will show the area under cultivation and the seeds obtained from the seed farms :—

Variety of crops grown from Departmental seeds.	Area under cultivation in seed farms (in bighas).	Quantity of pure seeds obtained.
		Mds. Srs.
Indrasail	271½	986 30
Kataktara	183½	572 20
K. B. Jute	67	33 37
C. green jute	4½	7 22
Groundnut	34½	160 0
Dhaincha	4	10 0
Tanna Sugarcane	171½	588,000 setts.

Besides the above, other 8 seed farms have recently been organised for jute growing in the district of Rangpur.

The total area of seed farms already organised for seed propagation is 430 bighas. Of all the existing seed farms Dayarampore, Dighapatia and Sukna farms deserve special mention. The Director of Agriculture visited all these three farms.

Organisation of Co-operative Agricultural Associations.

According to the policy laid down last year, Co-operative Agricultural Associations are now being organised. The Pabna Agricultural Association has already reorganised three of its rural associations on a co-operative basis and have had them registered under the Co-operative Societies Act. Another rural association in Malda is applying for registration very soon. The Hon'ble Minister of Agriculture visited two of our Rural associations—one at Rangpur and another at Malda.

List of existing Agricultural Associations in the Circle.

District.	No. of Agriculiural Associations.	No. of Subdivisional Associations.	No. of rural Associations.
Rajshahi	.....	1	7
Pabna	1	1	7
Malda	1	.....	9
Bogra	1	.....	1
Rangpur	1	1	19
Dinajpur	1	2	3
	5	5	46

The Rangpur-District Agricultural Association is an organised body. It maintained three Demonstrators and the three seed stores at Gaibandha, Nilphamari and Burirhat, the latter having been constructed out of its funds.

Exhibitions.

There were altogether three important Agricultural and Industrial Exhibitions in the Circle during the year under report, namely, at Kalimpong, Pabna and Malda. The Kalimpong Exhibition was organised by the St. Andrew's Colonial Homes and it was mainly meant for encouraging home industries and local agriculture. The Pabna Exhibition was held on the premises of the Pabna Farm ; it was opened by the Director of Agriculture. The Malda Exhibition was opened by the Hon'ble Minister. The Agricultural Department was represented in both the exhibitions with all its branches. Exhibits were explained and practical demonstrations on the use of improved implements were given by our officers. At the Pabna Exhibition I lectured before big assemblies for two days on improved agriculture with the help of lantern slides.

Experiments.

The number of experiments have greatly been increased during the year. Experiments are being carried out in Rajshahi Farm, Rangpur Demonstration Farm, Burirhat Farm and the Rangpur Cattle Farm by the farm staff under the instructions of the Fibre Expert, Agricultural Chemist and the Economic Botanists. Particulars will be found in the reports of those farms.

Hissar-bred Stud Bulls.

Eight beautiful half-bred Hissar bulls reared on the Rangpur Cattle Farm have been sent out to different farms for stud purposes with a view to improving the local need of cows. There are still a few half-bred Hissar bulls available for the purpose in the Cattle

Farm. Our District Boards, Municipalities, Agricultural Associations and similar bodies or public spirited zamindars may like to take advantage of this by placing one or two bulls here and there for the improvement of the local cows.

List of half-bred Hissar bulls placed in different Government farms.

Rajshahi Farm	2
Rangpur Demonstration Farm	1
Burirhat Farm	2
Pabna Demonstration Farm	1
Bogra Ditto	1
Chinsurah Farm	1
	8

Khas Mahals.

Jalpaiguri.

Moynaguri, Alipur Duars, Falakata and Kumargram are the four tahsils in the district; each of them maintained a seed store in charge of an Agricultural Sub-Overseer. Most of our work in this district is confined in the khas mahals and the District Agricultural Officer has therefore to spend a greater portion of his time there.

As in previous years, demonstrations were undertaken with *kharif* crops and improved implements. Besides these, the Board sanctioned Rs. 1,400 for the distribution of seeds of *rabi* crops in the year under report.

Darjeeling.

Agricultural improvements in the Siliguri Subdivision were conducted by the District Agricultural Officer of Siliguri. An Agricultural Sub-Overseer was maintained by the Khas Mahal during the season for a few months. The improvement work of Kalimpong Khas Mahals was looked after by Mr. Edmunds, Manager of the Kalimpong Farm with the help of two Agricultural Sub-Overseers, and four demonstration centres were organised.

Malda.

There is a small khas mahal at Panchanandapur in this district. An Agricultural Sub-Overseer was posted there this year. A seed store building was constructed at a cost of Rs. 2,500 and placed under the Sub-Overseer. There is a proposal to have a seed farm attached to it.

It is the place where groundnut cultivation was first introduced in this Circle. The area under it was 3 bighas in 1919-20, the year of introduction. But in the year under report the area increased to 50 bighas.

Dhaincha green manure on *rabi* cereals and the cultivation of Jaunpur maize gave satisfactory results.

Rajshahi.

The Khas Mahal is divided into two tracts.—Barind and Char lands. Work has been commenced in Sibnagar centre in the Barind tract and in Khidirpur centre in the Char lands. Bonemeal on aman paddy gave excellent results in the Barind. The increased outturn in various demonstration plots varies from 3 to 6 maunds of grain per acre.

An Agricultural Sub-Overseer was maintained by the Khas Mahal.

Bogra.

The Jaipurhat Khas Mahal has recently constructed a seed store building at a cost of Rs. 2,000 which is placed in charge of its newly-appointed Agricultural Sub-Overseer.

Court of Wards.

Rangpur.

The Kassimbazar Ward's Estate maintained an Agricultural Sub-Overseer in charge of its seed store at Lalmonirhat. The Divisional Commissioner sanctioned the usual grant of Rs. 750 for agricultural improvements in this estate.

Dinajpur.

The Agricultural Sub-Overseer, Jan Bazar Ward's Estate, remained in charge of its seed store at Parbatipur. The old seed store house has been dismantled and a new one is being constructed at a cost of Rs. 900. A seed farm of 25 bighas is being started at Chandipur and another small farm will, it is hoped, be attached to the Parbatipur seed store.

Bogra.

The Karatiya Ward's Estate of Mymensingh has a tahsil at Paikar in the laterite soil of Bogra. It maintained an Agricultural Sub-Overseer and placed him in charge of a seed store and a farm of 45 bighas. Out of this area 42 bighas were under *Indrasail* paddy.

The work done for the improvement of agriculture in Khas mahals and Wards' Estates are under supervision of departmental officers and the copping scheme is also prepared by them.

Seed Stores.

There are altogether 26 seed stores in this Circle. Improved seeds raised by the experts on the Government farms, seeds of new crops, improved implements and manures were supplied to the cultivators from these stores. The chief seeds, manure and implements supplied from these stores are :—

(1) *Indrasail aman* paddy, *Kataktara aus* paddy, Jute D. 154, R. 85, Chinsurah Green and *Kakya Bombai*, *Tanna* cane sets, cotton seeds, Pusa wheat, oats, peas, wheat, groundnut, maize, gram and lentils.
(2) Castor cake, bonemeal, *dhaincha* and sunn-hemp.
(3) Planet Junior Hand Hoe, Meston plough, and three-rollered cane-crushing mills.

A list of seed stores is given below :—

Districts.	Number of seed stores.
Rangpur	5
Jalpaiguri	5
Dinajpur	2
Bogra	3
Malda	3
Pabna	1
Darjeeling	1
Rajshahi	6
	26

Miscellaneous.

Jute forecast.—As was the case last year, 30 jute clerks were entertained for five months this year to check jute areas and make crop-cutting experiments in the Circle. The Conference of the Director of Agriculture, Collectors and departmental officers of the Division took place on the 12th September at Jalpaiguri.

Agricultural Survey.

The District Agricultural Officers are collecting under the direction of the Superintendent of Agriculture information of their respective districts. The work is only in its initial stage yet, and it is doubtful whether District Agricultural Officers are sufficiently well trained or have the time to do the work properly.

Distinguished Visitors.

The Hon'ble Minister of Agriculture visited the Rangpur Cattle Farm, Burirhat, Pabna and Rajshahi Farms during the year under report. The Commissioner of the Division visited the Bogra Farm twice during the year. The Collectors visited our farms situated in their respective districts very frequently. The Director of Agriculture and the experts of the Department visited the farms frequently.

Acknowledgments.

Our thanks are due to the Collectors and Subdivisional Officers for help received from them.

Thanks are also due to the Khas Tahsildars, Court of Wards' Managers and Secretaries of different Agricultural Associations for their constant co-operation. The names of Babu Harendra Nath Mazumdar, Khas Tahsildar of Moynaguri, Babu Anapi Nath Sarkar, Khas Tahsildar of Falakata, Babu Aswini Kumar Maitra, Khas Tahsildar of Jaipurhat, Babu Jitendra Nath Majumdar, Joint-Secretary of the Pabna District Agricultural Association, and Babu Amrita Lal Chakrabarty, Secretary of the Dasuria Rural Agricultural Association, deserve special mention.

In this connection mention may also be made of the following gentlemen who take special interest in our work :—

Mr. Sarat Kumar Roy of Dighapatia.
Khan Bahadur Maulvi Mahamad Ershad Ali Khan Chaudhuri, M.L.C., of Natore.
Khan Bahadur Maulvi Wasimuddin Ahmed, M.L.C., of Pabna.
Babu Ashutosh Lahiri of Rangpur.

J. N. SIRKAR,
Offg. Deputy Director of Agriculture,
Northern Circle, Bengal.

APPENDIX A.

Area under our recommended seeds in the Circle.

District.	*Indrasail* paddy.	*Kataktara aus.*	K. B. jute.	Chinsurah Green.	R. 26.	Ground-nut.	Tanna sugarcane.
	Bighas.	Bighas.	Bighas.	Bighas	Bighas.	Bighas.	Bighas.
Darjeeling ...	206		92	...	...	...	4
Jalpaiguri ...	1,923	345	885	...	...	...	4
Rangpur ...	7,844	220	3,700	...	...	...	200
Dinajpur ...	1,192	25	186	...	...	...	8
Bogra ...	4,331	72	1,722	...	...	5	57
Malda ...	225	160	262	...	...	82	6
Rajshahi Sadar ...	5,800	6	40	2	15	4	40
Nator and Naogaon ...	255	48	104	17	...	7	40
Pabna ...	112	12	135	13	4	...	3

APPENDIX B.

Important Centres of work where Demonstrators are located in this Circle.

District.	Number of demonstrators.	Stationed at—	Maintained by—
Rangpur ...	1	Rangpur Sadar	Department.
	1	Nilphamari	Ditto.
	1	Gaibandha	Ditto.
	1	Kurigram	Ditto.
	1	Burirhat	Agricultural Association.
	1	Rangpur Sadar	Ditto ditto.
	1	Gobindaganj	Ditto ditto.
	1	Lalmonirhat	Kassimbazar Ward's Estates.
Dinajpur ...	1	Sadar	Department.
	1	Thakurgaon	Ditto.
	1	Balurghat	Ditto.
	1	Parbatipur	Janbazar Ward's Estates.

District.	Number of demonstrators.	Stationed at—	Maintained by—
Jalpaiguri ...	1	Sadar	Department.
	1	Moynaguri	Khas Mahal.
	1	Falakata	Ditto.
	1	Alipur Duars	Ditto.
	1	Kumargram	Ditto.
Darjeeling ...	1	Siliguri	Department.
Malda ...	1	Malda Sadar	Department
	1	Harishchandrapur	Ditto.
	1	Panchanandapur	Khas Mahal.
Bogra ...	1	Bogra Sadar	Department.
	1	Sherpur	Ditto.
	1	Santahar	Ditto.
	1	Khanjanpur	Ditto.
	1	Paikar	Court of Wards.
	1	Khanjanpur	*Khas Mahal.
Pabna ...	1	Pabna Sadar	Department.
	1	Kabirpur	Ditto.
	1	Ishurdi	Ditto.
	1	Kazipur	Ditto.
	1	Serajganj	Ditto.
Rajshahi ...	1	Godagari	Department.
	2	Rajshahi Sadar	Ditto.
	1	Puthia	Ditto.
	1	Nator	Ditto.
	1	Naogaon	Ditto.
	1	Bilmoria	Ditto.
	1	Dayarampur	Ditto.
	1	Shibnagar	Khas Mahal.
	1	Dayarampur Farm	Kumar Sarat Kumar Roy.
	1	Dighapatia	Dighapatia Raj.
		Tobacco demonstrators.	
Rangpur ...	1	Burirhat	Department.
	1	Tobacco Farm	Ditto.
	1	Chilakhol	Ditto.
		Farm Demonstrators.	
Bogra ...	3	Bogra Farm	Department.
Pabna ...	1	Pabna Farm	Ditto (Tempy.).

* Recently appointed. The departmental demonstrator will be withdrawn within April 1922.

APPENDIX IV.

ANNUAL REPORT OF THE FIBRE EXPERT TO THE GOVERNMENT OF BENGAL FOR THE YEAR 1921-22.

Charge.

I proceeded on long leave on the 5th April 1921 and returned to duty on the 16th February 1922. Mr. McLean officiated until his departure on leave in October, when he gave over charge to my assistant, Babu N. C. Basu, who acted until the date of my return. During the year Babu Tara Nath Roy was appointed to officiate in the Provincial Agricultural Service and to have charge of the Central Farm at Dacca. Babu K. C. Banarjee officiates for him as my Field Assistant.

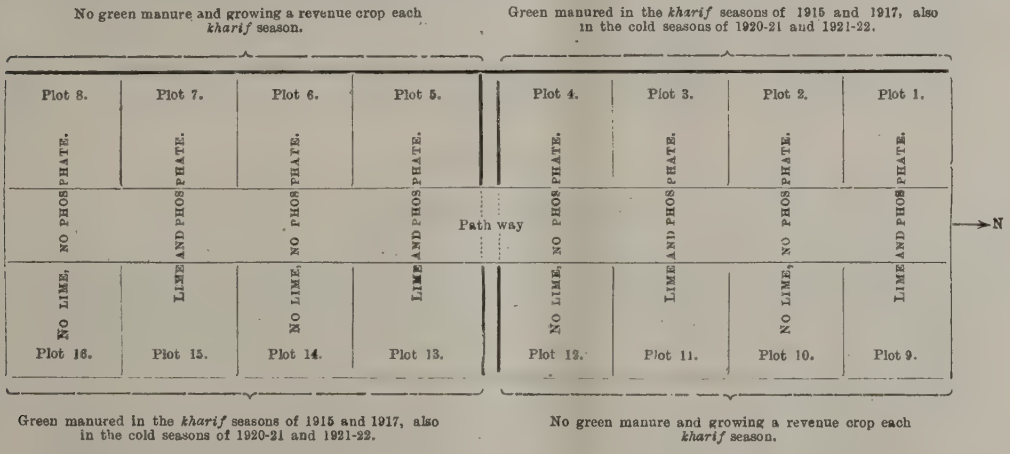
Tours.

Mr. McLean spent 40 days on tour between the 5th April 1921 and the date of his departure on leave. Mr. Basu spent 32 days in the district and I was away from headquarters for 13 days after my return from leave. The staff spent 90 days in touring.

Manure for jute on acid red soils.

Central Mirpur Experiments.—This subject has been dealt with in these reports each year since 1916.

For convenient reference, the plan of the plots, which explains the nature of the experiments, is reproduced from former reports.


No green manure and growing a revenue crop each *kharif* season.
Green manured in the *kharif* seasons of 1915 and 1917, also in the cold seasons of 1920-21 and 1921-22.
Plot 8.
Plot 7.
Plot 6.
Plot 5.
Plot 4.
Plot 3.
Plot 2.
Plot 1.
NO PHOSPHATE.
LIME AND PHOSPHATE.
NO LIME.
Path way
N
Plot 16.
Plot 15.
Plot 14.
Plot 13.
Plot 12.
Plot 11.
Plot 10.
Plot 9.
Green manured in the *kharif* seasons of 1915 and 1917, also in the cold seasons of 1920-21 and 1921-22.
No green manure and growing a revenue crop each *kharif* season.

N. B.—(*a*) Diagonally opposite quarters of the series receive identical treatment, *i.e*, green manure or no green manure as the case may be.

(*b*) Alternate strips receive lime and phosphate as shown in the plan in the years 1915, 1918 and 1920.

(*c*) The whole area received a general manure containing 40 lbs. nitrogen per acre in 1915, 1916, 1918 and 1920 also hyacinth ash, equal to 100 lbs. K_2O per acre in 1918 and 1920.

The original scheme contemplated the cultivation of jute and *aus* rice in alternate years ; but it has been found advisable to modify this for two reasons, viz. :—

(1) So frequent cultivation of jute on red soil tends to encourage fungus disease, in spite of the inhibitive effect of potash.

(2) Some of the plots which have received lime and have also been green-manured, are now in such good condition that *aus* rice grown immediately after jute "lies down" and so gives a diminished yield of grain. It has therefore been decided to introduce a green fodder crop into the rotation, after jute. An attempt is also being made to grow the green manure crop in the cold weather season and thus avoid the loss of a revenue crop involved in a monsoon season green manure. If this modification succeeds as a permanancy the monsoon or *kharif* rotation will be :—

(1) Jute.

(2) Green fodder (maize and cowpea, or millet).

(3) *Aus* rice.

A trial was made for the first time with maize and cowpea in the monsoon season in 1921. No fresh manure of any kind was supplied, the crop being grown on residues from the previous year. The following results were obtained :—

Treatment of plot.	Plot numbers.	Mean yield per acre.	Approximate value.
		Tons cwt.	Rs. AS.
Lime, phosphate	1, 3,	6 13	45 8
Green manure	13, 15,		
Lime, phosphate	5, 7,	6 12	45 0
No green manure	9, 11,		
Green manure	2, 4,	2 11	17 8
No lime or phosphate	14, 16,		
No green manure	6, 8,	2 5	15 8
No lime or phosphate	10, 12.		

Thus approximately three times the yield of green fodder was obtained from plots receiving lime and phosphate, as against plots not so treated. The effect of green manure is barely perceptible either in limed or unlimed areas. The crop on the former was a normal, healthy one, while the growth on unlimed land was poor and stunted. The estimated gross return from the plots is based on a price of 4 annas per maund (Rs. 7 per ton) for the green fodder. At this rate the produce of the limed plots covered expenses of cultivation, and gave a few rupees profit, while there was a loss on the unlimed plots.

The results are a further striking demonstration of the beneficial effect of lime, phosphate and potash on the acid red soils of Eastern Bengal.

Seed, Jute.

Corchorus capsularis.

The amount of jute seed produced in the year under review, *i.e.*, 900 maunds (35 tons) of that of *C. capsularis* and 100 maunds of *C. olitorius* was about the same as in the previous year, but little more than half the normal. The reason for the deficiency was partly because a poor crop in Assam gave less seed, and partly because sugarcane was again a serious competitor in Bihar. The seed retained all its popularity and there was a great demand for it wherever it was on offer. When all supplies were disposed of, large numbers of cultivators took the trouble to make a day's journey, by train or steamer, to the Dacca Farm, in order to personally investigate the possibility of obtaining more seed. The price charged was Rs. 20 per maund for seed of *C. capsularis* and Rs. 40 for that of *C. olitorius*. The price of *capsularis* seed is to be raised to Rs. 30 in the next season.

In view of the great discrepancy between the supply of departmental jute seed and the demand for it it is important to investigate other means of production than those at present available. Agricultural associations are being formed with the object of producing jute seed, but it is necessary to feel the way carefully as a great difficulty in controlling the quality and purity of the seed is met with. The reputation of the departmental seed has hitherto rested partly on its capacity to produce an increased yield of fibre, but it is also partly due to the generally excellent quality of the seed. Each of these properties is of very great importance, and if the seed sold ever become seriously mixed, or if its germination capacity becomes poor, the whole demand for Departmental produce, which has so laboriously been built up, will collapse at once. Seed farms are a second proposal, but it remains to be proved that these are a financial proposition with seed at its present price.

Ultimately the problem narrows itself down to the fact that the price of jute seed is at present too low to make jute seed production more than a doubtful economic proposition in Bengal. Even in Bihar, sugarcane has overshadowed it in recent years.

It may be recalled that the original price paid to producers of jute seed was only Rs. 8 per maund of 80 lbs. It is now Rs. 15, and it is hoped that it may be Rs. 20 next year. It will then begin to be comparable with other crops in the matter of revenue, and further rises in price will make it worth the while of the private grower to cultivate seed jute, as against other crops. In this case there will be no further difficulty with

the supply of jute seed, for the conditions for the seeds-man, as he exists in England, will, as far as jute is concerned, have been brought about. This is what is to be aimed at in India and, if the aim is achieved, there will be a fine opening for young Indians who have had an agricultural training and who desire to pursue a practical agricultural career. Intelligent private enterprise is the only means capable of supplying the enormous amounts of pure seed which will be required for the various crops.

Corchorus olitorius.

About 70 maunds (2½ tons) of the seed of Chinsurah Green were produced in Bihar, the United Provinces and in Western Bengal. There is a considerable demand in the "*Bogi*" districts of Eastern Bengal for this seed, much more of which could be sold if it were available.

Inhibition of fungus diseases of jute (corchorus spp.) and of other plants by manurial treatment of the crop.

In collaboration with the Imperial Mycologist an enquiry has, for several years past been pursued into this subject. Our attention was forcibly attracted to it by a severe attack of Rhizoctonia on jute at Dacca, and it was ultimately found that this was at least partly due to lack of available potash. Other instances of a similar kind are available, *e.g.*, pigeon pea wilt (*Fusarium udum*, Butl.), which is apparently encouraged by application of phosphoric acid, but inhibited, even in case of an application of phosphoric acid, by previous green manuring. A third example is the black band disease of jute *Diplodia corchori*, which at first decimated seed jute crops in Bihar. It has been circumvented by seasonal evasion : in this case, late sowing. Comparative ash analyses of early and late sown jute crops in Bihar indicated the presence of greater proportions of sodium and sulphuric acid in the late sown crop, and applications of sodium sulphate as a manure to seed jute crops at Pusa have been found in two successive years to markedly inhibit disease in early sown jute kept as a seed crop.

Field experiments are in progress both at Dacca and at Pusa. The subject is one of extreme interest and is by the way, in spite of the laborious analytical work entailed on it, attracting increased general attention from chemists who are interested in agriculture.

SINGLE PLANT CULTURES.

C.—Capsularis.

In the season 1921 there were 559 single plant cultures at Dacca. As in previous years, most were pure-line selections being grown against a standard (D. 154) ; but there are also a number of hybrids. Very few of the new cultures now give favourable indications, there being only ten such in the year under review. These will be multiplied and may ultimately come into the variety plots. Of previous years' selections, four are included in this year's variety test.

C.—Olitorius.

No work with this species was done, excepting to grow one or two plots of it in order, to keep the strain pure.

(5) Hybrids.

Hybrid cultures numbered 70 at Dacca and 30 at Mymensingh. One more hybrid has been multiplied sufficiently to be brought into the variety tests and one other will be multiplied in the present season. Both these hybrids are promising as far as height is concerned, and both surpass the standards by a considerable margin in this respect. If remains to be seen whether the percentage of fibre the plants contain is equally good.

Chlorosis.

Collaboration with the Economic Botanist in the investigation of *chlorosis* in jute continues, and extensive experiments, involving 157 single plant cultures in 1921, are being made to determine, by simple selection and, by means of cross-fertilization between chlorotic and non-chlorotic plants, how far the incidence of *chlorosis* can be controlled, and how far its transmission from parent to progeny follows ordinary Mendelian laws. There now seems to be no reasonable doubt of the connection between the state of development of the surface root system and the incidence of *chlorosis*.

Length of ultimate filaments.

This investigation has received considerable attention in the period under review and a very large number, roughly 250,000, measurements of ultimate filaments have been made. There seems little doubt that the length of the filament is a hereditary function, though it is also subject to variation due to environmental action. Cross fertilization between plants of great stature, and others having long ultimate fibres have been made, and are now being multiplied. It will be interesting to see how far, if at all, the length of the ultimate fibre determines quality, *i. e.*, fineness, strength, etc., in a bast fibre.

VARIETAL TESTS.

Corchorus capsularis.

The comparison of the three pure races Kakya Bombai, R. 85 andD. 154 was continued at Dacca and at the Rangpur Demonstration Farm. At Dacca two new races were included, viz., D. 27, a new pure line selection, and Dhal × Kg, a hybrid.

After three years' tests at a number of places, it is obvious that there is little to choose between Kakya Bombai, R. 85 and D. 154, but the figures are on the whole slightly in favour of D. 154, which will, for the present, be accepted as the best race in our possession.

The two new races are also heavy yielders whose capacity is not far below that of the others.

The results at Rangpur confirmed those obtained at Dacca.

The following are the figures :—

	Dacca.		Rangpur.		
	Mds.	Srs.	Mds.	Srs.	
D. 154	16	32	23	11	per acre.
R. 85	16	13	22	0	„ „
Kakya Bombai	16	19	21	32	„ „
D. 27	15	35			
Dhal × Kg	15	27			

It should be remarked that the seasons 1920 and 1921 have, owing to long periods of drought, both been unfavourable for jute at the Dacca Farm. Otherwise the margin in favour of D. 154 might have been rather greater than the above yields indicate.

Corchorus olitorius.

During the last two years, seed of an old green race from the original Pusa collection has been multiplied to compare with Chinsurah green. A pure line from a single plant found at Haldibari by Messrs. Sinclair Murray & Co., was also ready to test, and R. 26 made up a series of four races. The results were very similar to earlier ones, in that Chinsurah green is again shewn to be in a class by itself.

	Mds.	srs.
Dudshai	26	10
R. 26	27	20
Chinsurah Green	33	0
Haldibari	26	0

Experiments with jute in the United Provinces.

In last year's report it was mentioned that experimental cultivation of jute in the Ganjar tract in the United Provinces had been successful and that about 80 maunds of fibre was produced and sold in Calcutta. In the year under review, 97 acres of jute were grown all without irrigation. In spite of the heavy floods, the jute crop (*C. capsularis*) was successful in Ganjar ; while other *kharif* crops suffered seriously. In Shapor and Rampor Muthra however both C. capsularis and C. olitorius were damaged by heavy flood and excessive rain in the early stages of the crop.

Three hundred maunds of fibre and 75 maunds of seed were produced. The cultivators disposed of their fibre locally, and the Bengal Agricultural Department bought the seed which was all that of departmental pure lines.

As prices are likely to be high in the coming season, the cultivation of jute in the Ganjar tract is likely to become well established on a considerable scale, both for fibre production and for the propagation of seed.

The origiual experiments were made under the guidance of the writer at the instance of the United Provinces Department of Agriculture and selected Bengal cultivators have been employed on demonstration. Mr. B. C. Burt, Deputy Director of Agriculture, was in immediate charge of the first experiments and was succeeded in 1920 by Mr. Low.

Sunn-Hemp.

The attempts to devise an economic process whereby a crop of sunn-hemp could be utilized both as a fibre crop and for the purpose of green manure have been discussed at length in former reports.

When the writer went on leave in April 1921 he took a bale of artificially extracted sunn-hemp to London, where the contents were examined and discussed in collaboration with Messrs. Wigglesworth Brothers, the well-known fibre brokers in Fenchurch Street. Messrs. Wigglesworth were in no doubt regarding the suitability of the fibre for the English market and described one portion of the consignment as the best Indian hemp they have seen. At the request of Mr. W. R. Laird, late of Messrs. Mackinnon, Mackenzie & Co., of Calcutta, the fibre was afterwards sent to Arbroath where Mr. Laird, who is a believer in the possibilities of sunn-hemp as basis for canvas manufacture, had arranged with his brother for a careful test. Unfortunately Mr. Laird's brother died just before the test was to take place, and though Messrs. Webster Bros of Arbroath kindly undertook to spin the hemp, neither Mr. Laird nor the writer was able to see the test. Although good yarn was obtained the results were not as satisfactory as had been expected. They are, however, not to be regarded as conclusive, and Mr. Laird advocates further tests with another consignment of fibre.

In the meantime, progress is being made with the method of extraction with a view to increasing its speed and improving the quality of the produce. Arrangements have been made to prepare a considerable quantity of fibre at Pusa in the coming season.

Flax.

There is little to report regarding flax experiments in India in the year under review, excepting that samples of Cawnpore grown flax were well reported on in London. It appears that cold weather retted flax yields better fibre than straw-retted and scutched in the hot weather, but it may be possible to surmount this difficulty by proper control of conditions.

Flax at present prices is one of the most paying of the cold weather crops; an ordinary crop being worth, to the cultivator, somewhere in the region of Rs. 100 per acre. The chief difficulty hitherto has always been that the cultivator cannot satisfactorily extract his own fibre. The operation is a technical process which must, for satisfactory results, be carried out by an expert. In Ireland and Belgium the farmer generally sells his straw to a dealer, who sometimes carries the straw many miles by rail to a suitable retting place. This is what is being aimed at in India.

Recently a patented process for the extraction of flax fibre has been put forward. Unlike some of its predecessors, the process seems to produce a very good sample of fibre though, on account of its different appearance, spinners have not yet taken to it. Such a process might have considerable possibilities in India if there were an assured market for its produce.

During his leave in Europe the writer paid an interesting visit to the Belgian flax-producing districts, which seem to have recovered almost completely from the war, during the period of which they were in the area where much fighting took place. Many improvements in retting methods are being tried in Belgium also, and some, if successful, will tend to replace the time-honoured custom of retting in the river Lys, where so much of the finest flax has been produced in the past.

Other Investigations.

Sida.

The work on this fibre plant continues. Excepting in Bengal and Bihar, under our own supervision, the trials in India have not been very encouraging so far, but the comparatively poor results may be due to unfamiliarity with the method of cultivation. In Burma and the Malay Peninsula, more satisfactory results appear to have been obtained.

Sisal.

The comparative study of species of Agave and of races of Sisal continues. Attempts are being made to carry out an extraction test in the present season.

Paper Making.

The Chemical Assistant to the Fibre Expert has carried out a few experiments to investigate the possibilities of some waste substances, *e.g.*, betel-nut husk and jute stick, as *sources* of paper. Considerable quantities of both these substances are available in the respective tracts where they are cultivated. Though its ultimate fibre is a short one, the jute stick is easily treated and yields a white pulp with little bleach. It would not pay, on

account of its bulky nature, to carry it far ; but it is worth considering whether a small mill erected in a tract where jute cultivation is largely practised, and producing half-staff, might not prove a commercial proposition. The cost of the raw material which, in the dry stage, contains 50 per cent. of cellulose would be small.

Betel nut husk is a less promising proposition from the manufacturing point of view. The husk itself is a refractory material and when disintegrated requires heavy bleaching. The interior of the husk however contains a soft fibrous substance which, though too weak for spinning might, if separated from the husk, be useful as a paper-making material. The separation cannot be done by machinery and thus apparently only offers an opening for a cottage industry which, in view of the rising price of paper, might be worth encouragement.

R. S. FINLOW, B.SC., F. I. C.,

Fibre Expert to the Government of Bengal.

APPENDIX V.

ANNUAL REPORT OF THE ECONOMIC BOTANIST, BENGAL, FOR THE YEAR 1921-22.

Staff.

I held charge of the section throughout the year. Mr. S. G. Sharangapani, First Assistant, returned from long leave in August 1921. In the same month the post of First Assistant was included in the Provincial Service. One Field Assistant and one temporary clerk were added to the establishment. There were no other additions or alterations to the staff.

Tours.

I spent 56 days on tour, mainly inspecting experimental work on rice at various farms. I also attended the Board of Agriculture at Pusa in February as a member. The staff spent 114 days away from head-quarters, supervising work in progress at farms other than Dacca.

The following were the main items of work in progress :—

Rice.

The work on rice at Dacca and Chinsurah was continued on former lines.

1. The collections of transplanted *aman* and broadcasted *aus* varieties were grown again at both places. The collections will be maintained and promising type sent for trial to new district farms.

2. Critical yield tests of selected types at Dacca, Chinsura and Rangpur were continued.

At Dacca, trials were again held of *Indrasail* against the three later *aman* selections known as *Dhepi*, *Dudsar* and *Tilakkacheri*. In one set of tests *Indrasail* proved slightly superior to all (by 3, 8, and 6 per cent.). In another test, *Dhepi* and *Tilakkackeri* proved superior to *Indrasail* (by 3 and 6 per cent.). In trials on a larger scale conducted by the farm, *Indrasail* stood first. All these types have now proved themselves very heavy-yielding and can be recommended for distribution in suitable localities.

At Chinsura, *Indrasail*, *Dudsar* and three other recent selections (*Basamanik*, *Dabla* and *Sajani*) were again tested against local *Nagra*. *Indrasail* and *Dudsar* both beat local *Nagra* by 17 and 14 per cent. respectively. Of the others, *Basamanik* and *Dabla* beat *Nagra* by small amounts, while *Nagra* proved slightly superior to the third, *Sajani*. The superiority in yield of *Indrasail* over *Nagra* can now be said to be definitely proved. It has been tried against *Nagra* at Chinsura for four consecutive seasons (1918-1921), and has beaten *Nagra* three times by 7 per cent., 24 per cent. and 17 per cent., while *Nagra* stood first one year (in 1919) by 5 per cent. On an average of 4 years, therefore, *Indrasail* has beaten *Nagra* by 10·7 per cent.

This was the first season that the selected type known as *Dudsar* has been tested at Chinsura, where it is hoped it may prove valuable on account of its ripening earlier than *Indrasail* (Dacca No. 1). In our tests, as noted above, it beat local *Nagra* by 14 per cent., and was only 3 per cent. behind *Indrasail*. One acre of *Dudsar* was also grown on the farm, mainly for seed multiplication, and yielded 14 maunds 15 seers, while two adjacent acres of *Indrasail* yielded 12 maunds 12 seers per acre. The average yield of *Nagra* on the farm was only 7 maunds 32 seers. These yields are very poor, but the season was a very unfavourable one for paddy, on account of short rainfall. The results, however, indicate that there is every likelihood of this selection proving superior to the local *Nagra*.

At Rangpur, the pure line *Kataktara aus* paddy has definitely proved its superiority over the two most popular local varieties. Trials have now been conducted on the demonstration farm for three consecutive seasons with the following results :—

Variety.	Per acre, 1919.	Per acre, 1920.	Per acre, 1921.	Remarks.
	Mds. Srs.	Mds. Srs.	Mds. Srs.	
Kataktara ...	21 15	21 30	19 13	Each result is an aver-
Local *Sonamail* ...	19 35	16 0	14 0	age of eight $\frac{1}{20}$th acre
Local *Chapalo* ...	15 30	15 15	14 15	plots.

3. At Dacca, intravarietal selection work with two varieties of *aus* paddy has now been in progress for 7 years, and results have reached a stage when they can be summarised.

In the selection work with *aus* paddy, two lines have been followed—

(1) An almost exhaustive collection of varieties has been made from the various districts of East Bengal, and purelines selected from these, of which the types known as *Kataktara* and *Surjamukhi* have proved to be probably the best, for conditions such as prevail on the highlands of the Dacca Farm.

(2) Intravarietal selection was also started in 1915 with the varieties *Kataktara* (known in Dacca district as *Larkoch*) and *Surjamukki* themselves, to see how far they could be improved in yield. The methods pursued were practically the same in both varieties. In 1914, some 150 plants were selected from ordinary mixed local seed, grown on the botanical area and on the farm. These plants were divided into groups according to the number of tillers per plant and sown in single plots in the season 1915. In 1915, the number of grains per tiller per plant was determined in certain selected plots of the 150, and the plots arranged in order accordingly. These selected plots have been grown every year since, up to last season, 1921, and the average number of grains per tiller per plant has been determined in these plots five times, *viz.*, in years 1915, 1918, 1919, 1920 and 1921. The results prove undoubtedly that we have succeeded in selecting true-breeding high and low lines, on the basis of grains per tiller.

The original highest and lowest lines have maintained their place practically every year.

Last season the highest lines were tested for yield against the original pureline of *Kataktara* which the farm has been growing for several years and gave 34 per cent. and 41 per cent. increase, respectively.

4. Work on cross-fertilisation has been continued. The crosses between *Pukhi*, a very early *aus*, and later, better yielding types, were grown to the F_3 generation, and further selections made, which will be grown to the F_4 this season. Some of the Mendelian results obtained from this work have been published during the year as a Pusa Memoir. crosses between *Kataktara aus* and two varieties of transplanted *aman* have yielded very Interesting results. These crosses were undertaken with the object of endeavouring to obtain types suitable for land intermediate between ordinary highland *aus* and transplanted-*aman* paddy land. *Kataktara* is a strongly coloured variety, the late *aman* varieties were both wholly devoid of colour. The F_2 was grown this past season, and it has been observed that the dates of flowering are segregating into two distinct periods, approximating to the flowering periods of the early *aus* and late *aman* parents, with an interval of almost three weeks between during which no flowering takes place at all. Also it is found in every case that the ratio of late to early is practically 3 : 1.

Moreover, when we come to examine the distribution of the colour characters with reference to the flowering dates, we find an almost complete absence of the green early type, expected if independent segregation is taking place, and the figures approximate to a 1 : 2 : 1 ratio of coloured early : coloured late : green late. There is thus a strong linkage between colour and earliness in the *aus*, and absence of colour and lateness in the *aman*. The point is being further investigated and selections from the F_2 will be grown to the F_3 this next season.

5. The work on transpiration reported on last year was continued and previous results confirmed.

The main facts this work has brought out are :—

(1) Transpiration is a varietal character.

(2) The total water loss is markedly affected by the degree of soil saturation.

(3) For a given variety the transpiration ratio approximates a constant.

The results bring out very clearly the marked effect of soil moisture (1) on the growth of paddy (growth being measured by dry matter produced), number of tillers and height of plants, increasing regularly with increases in soil moisture almost up to saturation, and (2) on the duration of growth, as measured by number of days to flowering and ripening. Last season the mean flowering dates in the case of *kataktara* were :—

33	per cent.	saturation	...	...	...	3rd September 1921.
50	„	„	...	...	...	16th August „
75	„	„	...	...	...	7th „ „
100	„	„	...	...	...	30th July „

The saturated pots flowered 8 days sooner and ripened almost 3 weeks ahead of 75 per cent. pots. The experiments will be continued.

Rabi Crops.

The work on the survey and selection of varieties of the cultivated species of *Phaseolus* was continued. This work was carried on at Dacca, and duplicate series of plots were grown at Mymensingh, Rangpur and Rajshahi. The plots at Rajshahi were a complete failure owing to the attack of an insect. The types have been classified, and about twelve have been selected for multiplication and further trial. Some of these have been selected for high yield of grain, others for yield of leaf for fodder purposes.

Owing to the unsuitability of the Dacca soil for *rabi* crops, the Department has arranged for about 100 acres of khas mahal char land on the south bank of the Buriganga river. a little below Dacca Bazar, and this will be utilised for further work on cold weather crops.

Hill Millets.

The work on hill maruas at Kalimpong was continued.

Chlorosis in Jute.

The work on the inheritance of *chlorosis* in jute was continued. A number of crosses between chlorotic and non-chlorotic strains made in 1920 were grown in the season under review, and have given interesting results. At first it was supposed that *chlorosis* was handed on through the mother plant, but the results of crossing prove that the pollen parent has also a marked influence on the degree of *chlorosis*, non-chlorotic strains pollinated by chlorotic strains showing marked increases in *chlorosis*. The work is being continued.

Cotton.

The work in cotton was in the hands of the Second Economic Botanist and will be dealt with in his report. The varieties under trial are Dharwar, Buri and Cambodia, from each of which several types have been selected. This past season being exceptionally dry was a very favourable one, and one of the Dharwar types yielded at the rate of over 9 maunds *kapas* per acre. A survey of all the cottons at present grown within the province has also been started.

Mycology.

Babu P. C. Kar held the post of Mycological Assistant throughout the year. During this period he spent 53 days on tour, and the following were the main items of work in progress.

Paddy.

An outbreak of disease on *aus* paddy was reported by the District Agricultural Officer, Berhampore, on a big char in Bhagwangola thana. On examination the plant were found to be pale and stunted, while the inflorescence remained enclosed between the leaf-sheaths. Some wild grasses of the genus *Setaria*, on the borders, showed symptoms of the same disease. Eelworms were found in the tissues when microscopically examined, but they differed from the *Ufra* Eelworm. On enquiry it was found that there had been no rain for a long time, and drought was probably the main cause of the damage.

Ufra.

The districts of Noakhali and Comilla were surveyed in order to find out the extent of damage to paddy by *Ufra*, and to select plots to carry out demonstrations in remedial measures. Places like Feni and Begumganj which were notorious for *Ufra* for a number of years were found much better. In some of the fields near Sonamuri, where *Ufra* appeared, the attack was mild and the damage was negligible. On enquiry it was found that *Ufra* is gradually diminishing owing, it is said, to improvement in drainage, due to the encroachment of the sea. The cultivaters were advised to burn the diseased patches thoroughly when the fields become dry.

Jute.

Black-band disease of jute was practically absent in the fields of the Dacca Farm Macrophoma, which appeared very early, followed by Rhizoctonia, did some damage to the crop.

Sugarcane.

The attack of red-rot on J. 247 and B. 147 and smut on Saretha was mild as compared with the previous year. A thorough sett-selection was done, and some of the apprentices of the farm were trained in this work.

Wheat.

On Dacca Farm Pusa 12 totally escaped rust. *Puccinia triticina* and *Ustilago tritici* appeared on the *deshi* variety, but the attack was mild.

Oat.

Puccinia Lolii appeared on oats at Burirhat Farm, Rangpur. This was the second record of this pest, the first being at Pusa in 1907. The attack was very severe, and all the fields, about 12 in number, were affected. On enquiry it was found that the seed came from Bihar and the United Provinces. The Farm Superintendent was advised to harvest the crop and not to keep the seed for next year.

Chilli.

The chilli plot at Rajbari, which was sprayed with Burgandy mixture, gave satisfactory results. The outturn of the sprayed plot was more than that of the control. The experiment will be continued.

Palms.

The districts of Hooghly and Burdwan were surveyed in connection with "Bud-rot" disease of Palmyra palm, which was reported by Dr. Shaw, Second Imperial Mycologist, Pusa. The outbreak of the disease did not cause much alarm amongst the people, as this palm is not considered of such economic importance in Bengal as in Bihar and Madras. It was reported that 300 to 400 trees have been damaged in some of the villages in the past 5 or 6 years. From the survey it appears that the disease first broke out at Panduah on the East Indian Railway Chord line and Bengal Provincial Railway. Fortunately the disease has not yet been reported on cocoanuts in Bengal.

Areca palm.

For want of material inoculation experiments could not be taken up last year. Pure cultures were isolated from material collected from Assam and Haldibari, and inoculation experiments will be carried out during next rainy season.

Specimens.

Five parcels of diseased specimens were received and reported on.

Exhibition.

The Assistant attended the Pabna Exhibition.

Publications.

The Mycological Assistant contributed articles on the following to the Bengal Agricultural Journal:—

(1) Red-rot of sugarcane.
(2) Soft rot of ginger.
(3) Bud-rot of palmyra palm.
(4) Potato diseases.

Entomology.

Babu P. C. Sen held the post of Entomological Assistant throughout the year and spent 125 days on tour in the investigation of insect pests.

The most important pests observed and dealt with were the following:—

Green Orange Bug (*Rhynchocoris humeralis*).
Orange Tree-borer (*Monohammus versteegi*).
Speckled Orange Bug (*Cappœa taprobanensis*).
Mango Tree-borer (*Rhytidodera simulans*).
Large Brown Cricket (*Brachytrypes protentosus*).
White Ant (*Termes sp.*).
Litchi Bark-borer (*Arbela tetraonis*).
Mango Weevil (*Cryptorhynchus gravis*).
Army Worm of rice (*Leucania unipuncta*).
Rice Stem-borer (*Schoenobius bipunctifer*).
Jute Hairy Caterpillar (*Diacrisia obliqua*).
Sugarcane Moth-borer (*Diatrœa sp*).
Cotton Leaf-roller (*Sylepia derogata*).
Red Cotton Bug (*Dysdercus cingulatus*).
Ground Grass-hopper (*Chrotogonus sp*).
Mustard Saw-fly (*Athalia proxima*).

The following special items of work were also in progress :—

(1) *Green Orange Bug, Speckled Orange Bug.*—The life-histories of these pests were worked out. The remedial measures recommended are collection and destruction of egg clusters, so long as they are not parasitised, nymphs and bugs.

(2) *Orange Tree-borer, Litchi Bark-borer, Mango Tree-borer.*—Injection of turpentine oil into the borers' holes was found to be a remedy. The method is, however, not practicable in case of very big trees. Collection and destruction of the emerging beetles, in case of orange tree-borer, is also recommended.

(3) *White ant (in sugarcane seed-bed).*—Dipping the cut ends of setts in coal-tar before planting was found to be a preventive.

(4) *Mango Weevil.*—Bagging of fruits was continued with success. It has also been found that the general failure of a year's crop after the cyclone of September 1919, which meant starving out the weevils, has done a great deal in checking the pest, and the fruits of even the worst affected trees were almost free from the pest in the year under report.

Exhibitions.

(5) The Kalimpong and Pabna Exhibitions were attended with exhibits of the more important insect pests, insecticides, spraying-machines, charts, etc., which were explained to visitors. During the Agricultural Board meeting in 1921 a similar demonstration was also arranged in the laboratory for the benefit of members of the Board.

Training.

(6) Notes on common insect pests of rice, jute, sugarcane, cotton, etc., were given to the Dacca Farm school boys.

(7) *Identification.*—The Imperial Entomologist kindly determined the following insect pests which were sent to him :—

Green Orange Bug (*Rhynchocoris humeralis*).
Speckled Orange Bug (*Cappaea taprobeninsis*).
Orange Tree-borer (*Monohammus versteegi*).
Mango Tree-borer (*Rhytidodera simulans*).

Specimens.

A number of specimens were received and reported on.

Publications.—The following departmental publications were issued by the Entomological Assistant (Babu P. C. Sen) :—

(1) Insect pests of orange, in English and Nepali.
(2) Insect pests and general measures for prevention and remedy in Nepali.
(3) Rice Hispa, Large Brown Cricket. Articles in Bengal Agricultural Journal.

G. P. HECTOR,
Economist Botanic Bengal.

APPENDIX VI.

ANNUAL REPORT OF THE SECOND ECONOMIC BOTANIST TO THE GOVERNMENT OF BENGAL FOR THE YEAR 1921-22.

During the year I held the officiating charge of the Second Economic Botanist and spent 68 days on tour. I was assisted in my work by one Laboratory Assistant, Babu Sailesh Chandra Sen, M. Sc. and one Fieldman.

Botanical work was conducted as usual on deep-water paddies (*Oryza Sativa*) on pulses, viz., Masuri (*Ervum Lens*), Khesari (*Lathyrus Sativa*), field peas (*Pisum Sativum* and *Pisum Arvenese*), on oil-seeds, viz., Rape (*Brassica Napus*, vr. *Dichotoma*), Rai (*Brassica Juncea*) and Sarsons (*Brassica Campestis*, vr. *Sarson Prain*) and Til (*Sesamum Indicum*), on wheat (*Triticum Sativum*) and on cotton (*Gossypium sp*).

Deep-water paddies.

Work was begun with about 250 varieties of paddies collected from the districts of Faridpur, Barisal, Dacca and Sylhet. The varieties were found to be mixed in many cases and more than 434 types had been recognised last year. Of the 240 types sown in the deep-water area on the Institute lands about 78 types were found to stand the onrush of the flood water which rose to 6 feet within a period of 5 days, but until records on the growth of the different types have been kept for a number of years, nothing can be said about the flood-resisting qualities of the paddies under trial. A few types were selected for their heavy yield, and these are being grown for multiplication and for more thorough comparative tests.

Pulses—Masuri, Khesari and Motor.

Samples of seeds from each district were collected by the District Agricultural Officers and tried on the Rajshahi Farm. Preliminary notes have been taken and several plants from each type were selfed and these will be grown separately and studied further in detail. Various interesting scientific observations have been noted.

Oil-seeds.

Tori, Rai and Sarson have already been studied for some years past at the Dacca Farm, where owing to the soil condition, *rabi* crops do not grow to perfection. An alluvial area has been selected near the town of Dacca where the experiments will be conducted. Some types have been selected, but these require further tests and multiplication before they can be sent out to the public.

Work on gingely (*til*) and linseeds is being continued.

Wheat.

The work was based on the first preliminary selection of types by the Director of Agriculture, Bengal. The yield of wheat was very poor this year and selection work has only just been started on this crop.

Cotton.

Cotton had been grown at the Chinsura, Dacca and Mymensingh Farms and at the later two farms both as a rainy season crop and as a winter crop as well. Among the long-stapled Americans (viz., Buri, Cambodia and Dharwar) the Dharwar variety has given the best results this year which was favourably to this crop. As in the previous years May sowings have been found to be more profitable than June sowings. Several individual plants showing high-yielding character and higher ginning percentage and early ripening have been isolated. The long-stapled American types occupy the field for the entire agricultural year, and it would be desirable to develope a type which flowers early and ripens its bolls by November so as to be able to take a catch crop after cotton. Such a plant has been found and further selection work will be continued.

Cottons were grown as a winter crop at the Dacca and the Mymensingh Farms. The crop grew well at Dacca notwithstanding the adverse conditions. At Mymensingh the sowing had to be deferred till the 5th of November owing to continuous heavy rains in September and the moist soil conditions in October. The cotton is flowering now (April), but if it could have been sown earlier in the season (*i.e.*, end of September) as would have been the case in normal years, better results might have been obtained. The experiment will be repeated on char land near Dacca and further south on the Barisal Farm where a more equitable temperature can be expected during the winter.

Cotton Survey.

The work will be continued during the next agricultural season in collaboration with Dr. Hector, Economic Botanist to the Government of Bengal. It may be of interest to note that a type of plant has been found at Dewanganj, which is similar to the one described by Dr. Roxburgh as the Dacca Muslin cotton, a specimen of which has been preserved at Kew. The plant at Dewanganj is now dead, but we have been able to secure some seeds.

I am greatly indebted to Dr. Hector for the constant help, valuable suggestions and advice as regards work that I have invariably received from him. I have much pleasure in acknowledging with thanks the hearty co-operation of the Deputy Directors of Agriculture, Northern, Western and Eastern Circles, with their staff in the conduct of my experimental works on their farms.

D. DUTTA,

Offg. Second Economic Botanist to the Government of Bengal.

APPENDIX VII.

ANNUAL REPORT OF THE AGRICULTURAL CHEMIST TO THE GOVERNMENT OF BENGAL FOR THE YEAR ENDING 31st MARCH 1922.

Charge.

I remained in charge of the office of the Agricultural Chemist to the Government of Bengal, Dacca, during the year under report.

Staff.

Mr. G. B. Pal, M.SC., first Assistant, was appointed to the Provincial Agricultural Service from 13th August 1921 with the designation of Assistant Agricultural Chemist to the Government of Bengal. Babu Indu Bhusan Chatterjee, second Assistant, was sent on deputation to Pusa for two years for training under the Imperial Bacteriologist from 20th April 1921. Babu Surendra Chandra Rakshit, B.SC. (Cal.), was appointed as temporary Assistant in place of Mr. S. N. Bose from 1st June 1921. Babu Naba Kumar Nandy, M.SC. (Cal.), was appointed temporarily in place of Babu Indu Bhusan Chatterjee from 15th July 1921.

Tours.

I was on tour for 93 days visiting the various departmental farms in connection with soil sampling, tobacco work and sugar research The Assistant Agricultural Chemist was on tour for 29 days mainly in connection with date sugar and cane sugar work.

Provincial Soil Survey.

A considerable number of samples from the various Government farms and demonstration centres have been obtained and analysed in pursuance of the policy laid down last year. The results of analyses of a few of these soils are given in Appendix I.

Sugarcane.

For the analyses of the various canes on Dacca, Chinsurah and Rajshahi Farms, see Appendix II. Several new varieties have been added to the Dacca Farm collection, including a thick cane from Coimbatore.

A careful analysis of an irrigated block on Dacca Farm was carried out and provided some interesting figures shown in Appendix III. This will be repeated next year. A field experiment has been started with a view to finding out the cause of the high glucose content on red laterite soil.

A manurial series for Tanna Sugarcane has also been begun with the object of laying down some standard manure for this cane. These series are being carried out on the following farms :—Dacca, Chinsurah, Berhampore, Rajshahi and Pabna.

A number of experiments were carried out with the object of clarifying sugarcane juice. A partially successful laboratory method was obtained, but this was not practical on a field scale. Renewed experiments will be made next season.

Date sugar.

It was noticed that the furnaces in use at Kot-Chandpur (Jessore) and Manikgan (Dacca) for the production of date palm *gur* were very wasteful even though fuel is getting scarce. This shortage of fuel has been found to affect adversely the output of sugar. In order to see, therefore, if any improvement could be effected in the construction of furnaces both to economise fuel and also to improve the quality of the *gur* produced, experiments were undertaken at the Dacca Farm in date palm *gur* production. The date palm plantation on the farm not being ready for tapping, some 20 date palm trees were secured on hire purchase system in the vicinity of the farm. They were worked by an expert tapper brought from Manikganj. The method of tapping is much the same as is usual in Jessore. Every tree was tapped two days in succession and then allowed to rest for three days. Juice almost free from reducing sugars was easily obtained by taking care to cleanse the cut surface of the tree and renew every week the bamboo spout along which the juice trickled down. A solid cake of cream-coloured *gur*, usually called Hazari *gur*, was prepared until a sufficient quantity was obtained for the refining operation.

After several trials a furnace fitted with a grating made of corrugated iron was ultimately constructed which, it was hoped, would do well for the production of date palm *gur*. It is very simple in construction and quite inexpensive. It can be used equally well with such different fuels as paddy straw and split wood. No satisfactory trial in using a large quantity of juice was done for want of sufficient juice. From preliminary trials, however, by using sugarcane juice it was found that the consumption of fuel as also the time of boiling were much minimised.

The second line of work undertaken was to find out whether the action of water weed, pata shawala (used in Jessore) is purely physical or not, *i.e.*, due to a steady supply

of minute drops of water. Powdered Hazari *gur* was submitted to the action of water and various chemicals both acid and akaline in reaction and also banana stalks and smashed water hyacinth pulp. The following were some of the chemicals tried :—Sodium carbonate and hydroxide, potassium carbonate and hydroxide, alum and magnesium sulphate. The *gur* was kept in funnels and pads of cotton wool and asbestos soaked with water and aqueous solutions of the chemicals were put on the top of the funnels and allowed to react. For comparison, trials were also made using water weed brought from Jessore. It was observed that in all these cases a portion of the *gur* at the top (to the depth of quarter of an inch or so) in contact with the moist pad became sufficiently refined; but in none of the cases (even with water weed) could the operation be brought to a finish owing most probably to obstruction to free flow of molasses through the funnel. This effect of partial refining was observed even in the case where the *gur* was exposed to the action of water vapour only. As no satisfactory trials could be made, partially owing to the early and exceptionally hot weather which considerably hindered progress owing to early fermentation setting in, it is premature to say anything about the refining action of water weed on *gur*, tho gh a number of differences were noted in the various reactions. An improved method has now been devised and some definite results should be obtained next season. The farm plantation should then be ready for tapping and the whole process from tree to sugar will be carefully studied.

Tobacco.

The results of the interesting series of experiments carried out at Burirhat have already supplied some information regarding manures necessary for this crop. Sunn hemp and farm yard manure has given the best yield of all; while at the same time this green manure seems to have some deleterious effect on orobanche, a root parasite which is causing great damage.

Analyses of the manurial series will be undertaken in due course. Analyses of some of last year's crop have shown a wide variation in the amounts of the different constituents taken up by the plant as, for instance, Sumatra contains much more iron than aluminium as a rule, while Naokhol uses up much more aluminium than iron. Calcium also seems to be an important element and may play some part in the yellowing of the leaves. It is therefore obvious that each variety will require to be studied separately in regard to its manurial requirements.

Pot-cultures.

A preliminary experiment was started on a soil from Siliguri. This was black in colour, full of humus and from results obtained seemed to possess a considerable amount of all plant foods in a fairly available form. The application of lime to this acid soil probably hindered the action of the organic acids with the result that the paddy crop tried yielded considerably less than the unmanured control.

The second experiment was a tobacco manurial one, the soil used being the typical soil of the Rangpur tobacco district. The cigarette tobacco White Burly was used both because the effect would probably be more pronounced in this variety while it could also be used for flue curing purposes. Six combinations of manures were tried which with duplicates made up 12 pots. There were two control pots—unmanured. The pots with ammonium nitrate and ammonium sulphate were not good, and it is probable that these manures would be best applied as a top dressing. Even when a considerable interval elapses between the application of lime and the nitrogenous fertiliser, an adverse effect is obtained due to the release of ammonia and probably sulphides with ammonia sulphate. With the bonemeal and superphosphate pots it would seem better here again to apply superphosphate as a top dressing; but bonemeal however gave a good result. Cowdung and lime gave a similar yield to the control pots. This must be regarded as exceptional as the field results were better than this. The outstanding results were the pots in which fish guano and lime were used. Not only were the green weights much heavier than any of the others, but the texture of the leaves was much finer, and one of these plants flue cured gave the best coloured leaf as a result. See Appendix IV for results and quantities of fertiliser applied. The plants have now been ground up leaves, stalks and roots separately and an analysis is now being carried out to find out how much of each inorganic constituent each plant absorbed. These results will be utilised in next season's experiment.

The combination of fish guano and lime having proved so successful, a trial will be made on a field scale in the coming cold weather.

Research work on bonemeal effects.

The exceptional results obtained by an application of bonemeal and lime on the Dacca Farm soil has led to some research work being undertaken in this laboratory. The increased yield of paddy crops in the field is accompanied by early ripening together with a seemingly drought-resistant effect.

Considerable progress has been made in the laboratory, but it is yet too early to publish results. Pot-culture work in this connection is being started to assist the purely analytical side.

Results of field experiments at Dacca and Chinsura Farms are noted in Appendix V.

Routine.

A large number of analyses of manures and fertilizers were carried out, including a few for private individuals.

In conclusion I would like to emphasise the necessity for increased staff and laboratory accommodation in this section. The important research work at present in hand will take more than two years to reach anything like completion and such other urgent problems as cattle foods, dairy products, soil survey, together with the many special problems affecting soils and manures throughout the province must necessarily be shelved in the meantime.

I have pleasure in acknowledging the excellent service rendered during the year by Mr. G. B. Pal, Assistant Agricultural Chemist. My clerk, Babu Govinda Prosad Sen, has also done good work.

M. CARBERY,

Agricultural Chemist, Bengal, Dacca.

Note.

Four experimental plots were irrigated as follows :—

Plot No. 9 irrigated 5 times.
„ 10 „ 3 „
„ 11 „ 2 „
„ 12 „ once.

The idea of the experiment was to find out what effect irrigation had not only on the sucrose content of canes but also on the glucose content. From the attached graph it is apparent that in plots 9 and 10, the quantity of sucrose increased more rapidly to begin with than in plots 11 and 12. The sudden fall of sucrose content in plot No. 12 on the 29th December and the high result on January 9th in plot No. 11 must be regarded as exceptional, the former being probably due to the selection of diseased canes and the latter to the selection of the best canes in the plot. It also appeared that the date of harvesting should have been about the 9th of January with the exception of plot No. 9. The effect on reducing sugar is very clearly marked in the graph for glucose content. Here again the date of harvesting would appear to be about the 9th of January for all canes.

It should be noted that a reduction of the glucose content is of importance, as the less quantity there is of these non-crystalline sugars, the better the *gur* produced.

The results open the following questions which will be considered during the coming season—

(1) Quantities of irrigated water necessary and times of application.
(2) At what definite period the irrigation of canes should be stopped.

M. CARBERY,

Agricultural Chemist, Bengal, Dacca.

APPENDIX I.

Results of Soil Analyses.

PLACE.	H_2O moisture per cent.	Insol silicate and sand.	Loss on ignition.	Ca O.	P_2O_5 (Total).	K_2O (Total).	Mg O.	Nitrogen.	Fe_2O_3 and Al_2O_3.	REMARKS.
Burirhat Farm (Rangpur District).	·102	...	3·7	·80	·109	1·4	·87	...	4·2	Typical soils from tobacco-growing area.
	...	79·5	4·30	0 26	0·103	1·18	1·77	0·106	...	
	...	79·50	4·28	0·27	0·098	1·29	1·75	0·099	...	
	·96	...	3·38	·28	101	1·2	1·4	...	3·87	
Cox's Bazar (Chittagong District.)	...	91·51	2·63	0·20	0·031	0·37	0·35	0·074	...	Light sandy soil lacking humu sand lime.
	...	91·04	1·98	0·22	·024	0·43	0·41	0·033	...	
Darjeeling—Siliguri ...	..	86·19	7·23	0·20	0·109	0·46	0·57	0·232	...	Black soils full of humus.
	2·33	85·3	3·78	·18	·11	·46	...	...	...	
Rajshahi Farm	1·84	77·78	3·54	3·24	0·13	1·06	1·78	0·82	...	Typical soils of this district.
	2·78	73·53	4·50	2·87	0·13	1·20	1 99	0·10	...	
Bogra	1·08	...	4·18	·20	·28	0·26	·36	·32	...	Soil from demonstration farm.
	1·74	...	3·37	·32	·03	·636	·15	·074	...	
Barisal Farm (Bakarganj District)	2·248	65	6·146	1·02	·128	2·63	...	...	...	Low lying paddy land.
	1·902	71	5·258	1·98	·14	2·25	...	...	...	
Kepapara (Sunderbunds)	1·809	69·4	4·628	1·02	·16	2·05	...	...	...	Typical soil from Eastern Sunderbunds.
	1·546	71·2	4·606	1·005	·14	2·46	...	...	...	
Chandrakona surface soil (Midnapore district).	1·27	86·52	2·76	·13	·47	·53	·13	·035	...	High-lying red laterite soil typical of parts of Western Bengal.
	...	...	...	...	...	...	...	...	...	
Rangpur Cattle Farm ...	·84	81·13	3·95	·35	·17	1·2	1·47	·10	...	
	·94	81·67	3·48	·38	·17	1·3	1·58	·08	...	
Mymensingh Farm ...	1·02	81·11	2·78	·22	·153	1·02	1·12	·05	...	Fairly Typical soil of this district.
	·94	79·72	2·66	1·20	·144	1·20	1·08	·04	...	

APPENDIX II.

Results of sugarcane analyses, Dacca Farm, 1921-22.

	Varieties.	Specific gravity of juice.	Sucrose per cent. of juice.	Reducing sugar per cent. of juice.
1.	Malsa	1·070	14·224	3·46 (D).
2.	Vendamukhi	1·071	14·952	3·46 (V. D.)
3.	Hemza	1·073	16·184	2·69 (D.)
4.	J. 33	1·076	17·228	3·31 (D.)
5.	Badila	1·075	18 162	1·79
6.	D. 74	1·074 1·075	17·172 17·22	2·55 2·20 (D.)
7.	Sepaya	1·065	13·218	3·23 (D.)
8.	B. 147	1·070	14·762	2·77 (V. D.)
9.	Maxwell	1·075	15·482	3·73 (Little D.)
10.	Rangi	1·073	15·766	3·23 (V. D.)
11.	J. 247	1·068	14·488	3·31 (V. D).
12.	B. 208	1·083	20·30	1·03 (V. D.)
13.	D. 95	1·0785	18·868	1·61 (Little D.)
14.	Plot 15 of 1918	1·060	9·068	5·10 (D.)
15.	Kala Khagri	1·071	14·398	3·88 (V. D.)
16.	Seritha	1·073	15·596	2·69 (Black smut.)
17.	Red Mauritious	1·066	12·976	4·2 (D.)
18.	Kajli	1·073	15·142	3·46 (V. D.)
19.	Dacca Gandari	1·072	15·252	3·31 (R. R.)
20.	Yellow Tana	1·070	15·186	2 77 (Very little D.)
21.	Turpin	1·069	14·022	3·73 (V. D).
22.	White Bombay	1·074	14·734	2·62 (V. D.)
23.	Dhalsarang	1·071	16·112	3·12 (D.)
24.	Puri	1·070	15·316	2 55 (Little D.)
25.	Kuari Kusari	1·069	14·156	3·50 (D.)
26.	Samsara	1·076	16·524	2·77 (V, D.)
27.	Kajli (Burdwan)	1·075	16·306	3·23 (V. D.)
28.	Marikul	1·075	16·524	2·93 (V. D.)
29.	Bharang	1·065	12·948	3·23 (R. R.)
30.	Chona (Pabna)	1·077	16·712	3·34 (D.)
31.	Naroo (Barisal)	1·0685	14·448	3·23 (Little D.)

V. D. = Very diseased.
D. = Diseased, including Smut Red Rot Bores and white clutes.
R. R. = Red Rot.

Results of sugarcane analyses, Chinsurah Farm, 1921-22.

	Varieties.	Specific gravity of juice.	Sucrose per cent. of juice.	Reducing sugar per cent. of juice.
1.	Yellow Tanna	1·065	13·91	1·88
2.	Samsara	1·069	15·04	1·51
3.	Farm (unidentified)	1·068	14·28	1·84
4.	Vendamukhi	1 071	15·83	1·80
5.	B. 147	1·067	15·18	1·51
6.	J. 247	1·069	14·81	2·04
7.	B. 3412	1·071	15·54	2·35
8.	Yellow Tanna (exposed to sun) ...	1·071	15·55	1·03
9.	B. 208	1·063	13·96	1·96
10.	J. 33	1·070	14·65	3·13

Results of sugarcane analyses, Rajshahi Farm, 1921-22.

1.	Yellow Tanna (ordinary) ...	1·072	15·72	1·36
2.	Yellow Tanna (exposed to sun) ...	1·071	15·30	1·23

APPENDIX III.

Analytical results of sugarcane juice of "Yellow Tanna" Irrigated plots, Dacca Farm.

Date.	Plot No.	Specific gravity.	Temperature.	Per cent. Sucrose contained.	Per cent. reducing sugar.	Remarks.
						Irrigated—
7th December 1921	9	1059	68°F.	11·53	3·02	4 times.
	10	1058	68°	11·365	3·34	3 ,,
	11	1060	67°	12 5	2·85	2 ,,
	12	1061	67°	12·11	3·34	1 time.
22nd ,, ,,	9	1065	64° 5F.	13·92	2·30	5 times.
	10	1064	64°	13·30	2·85	3 ,,
	11	1065	64°·25	13·52	2·55	2 ,,
	12	1063 5	64°·5	12·78	3·31	1 time.
29th ,, ,,	9	1068	62°·5F.	14·482	2·30	5 times.
	10	1067	62°·75	13·49	3·02	3 ,,
	11	1065	62°·75	13·512	2·76	2 ,,
	12	1061·5	63°	12·042	3·34	1 time.
9th January 1922 ...	9	1067	64°·25F.	14·346	1·98	5 times.
	10	1069	63°·25	14·326	2·69	3 ,,
	11	1070	63°·25	15·026	2·20	2 ,,
	12	1067	63°·5	14·278	2·74	1 time.
10th ,, ,, ...	9	1071	63°·125F.	14·392	2·20	5 times.
	10	1071	62°·5	14·046	2·69	3 ,,
	11	1068·5	63°·125	13·77	2·55	2 ,,
	12	1069	62°·25	14·158	2·55	1 time.

APPENDIX IV.

Pot-culture experiments with 'Tobacco.'

Manures.	Green weight of the plant.	Green weight of the root.	Height of the plant.	
	lbs.	grams.	ft.	in.
1. No manure	1⅛	68	2	8
2. Lime and fish guano ...	2½	161	3	4
3. Lime and cowdung and bonemeal.	2	114	3	2
4. Lime and cowdung and superphosphate.	1½	68	2	10½
5. Cowdung and lime ...	1½	60	2	11
6. Ammonium nitrate and lime.	¾	30	2	0
7. Sulphate of ammonia and lime.	¾	44	2	1

	Mds. per acre.
Cowdung (·67 per cent. N.)	300
Lime	30
Fish guano (6·37 per cent. N.)	20
Bonemeal (29 per cent total $P_2O_5^{II}$)	4
Superphosphate	3
Sulphate of ammonia	7
Ammonium nitrate	5

APPENDIX V.

Results of 'bonemeal' experiments on paddy (aman), Chinsura Farm, 1921-22.

Manure.	Average yield of grain.			Average weight of straw.		
	Md.	Srs.	Ch.	Md.	Srs.	Ch.
No manure	0	27	10	1	16	14
Bonemeal, every year ...	0	30	0	1	6	12
„ „ 2nd year ...	1	6	0	1	20	8
„ „ 3rd „ ...	0	39	8	1	18	12
Rock phosphate every year ...	0	22	8	1	33	8
„ „ 2nd year ...	1	1	4	1	17	12
„ „ 3rd „ ...	0	34	0	2	5	0
Rock, phosphate and castor cake—						
Every year ...	1	1	4	1	17	0
2nd „ ...	0	22	8	1	15	0
3rd „ ...	0	11	0	1	17	12

RESULTS OF MANURIAL EXPERIMENTS ON INDRASAIL PADDY, 1921-22.

Dacca Farm—Sunti Low.

Manure.	Average yield of grain per acre.			Average yield of straw per acre.		
	Mds.	Srs.	Ch.	Mds.	Srs.	Ch.
1. Bonemeal	14	22	7	46	12	0
2. Bonemeal and lime ...	16	39	9	51	29	0
3. Rock phosphate	15	35	4	49	35	0
4. Rock phosphate and lime ...	11	37	15	39	24	0
5. Lime	17	3	1	48	21	0
6. No manure	12	24	12	41	13	12

APPENDIX VIII.

ANNUAL REPORT OF THE CHINSURAH AGRICULTURAL STATION FOR THE YEAR 1921-22.

Introduction.

This station was opened in 1908. It is situated to the west of Chinsurah Railway Station, East Indian Railway, and is 3 miles west of the town of Chinsurah. It is only 38 inches above sea level and comprises an area of 210 acres, of which 159 acres are under cultivation, 16 acres being made over to the Agricultural School and the rest being occupied by buildings, roads, tanks, jhils, etc. The soil is generally suited for jute, winter paddy and sugarcane with proper rainfall. It has to depend entirely on seasonable showers. The water of existing ditches and tanks is insufficient to allow of irrigation experiments. A thorough re-excavation of the water shortage areas, resulting in the formation of a highland area which the farm is in want of and an improvement of the drainage are both absolutely necessary. The early allotment of funds and the carrying out of these two schemes cannot be put off in the interest of the farm any further.

The object of the farm is to ascertain by experiments what crops, manures and methods of cultivation are suitable for the type of soil existing in Hooghly district generally and to produce seeds of improved and recommended varieties of crops for distribution.

Soils.

The soil is mostly clay loam and is representative of the Gangetic alluvium to the west of the Hooghly. It is fertile and capable of growing good crops with the requisite water-supply. The table below shows the percentage figures of analysis of soil and sub-soil :—

Table.

—	Highland soil, No. 1A Lab. No. 144.	Highland sub-soil, No. 1B Lab. No. 145.	Block A soil, No. 2A Lab. No. 146.	Block A sub-soil, No. 2B Lab. No. 147.	Medium soil, No. 3A Lab. No. 148.	Medium sub-soil, No. 3B Lab. No. 149.	Low land soil, No. 4A Lab. No. 150.	Low land sub-soil, No. 4B Lab. No. 151.
1	2	3	4	5	6	7	8	9
Insoluble silicate and silica	77·25	...	71·20	...	67·00	...	63·38	...
Combined water and organic matter.*	5·29	...	5·05	...	8·33	...	9·59	...
Ferric oxide and allumina...	14·77	...	20·14	...	21·48	...	22·84	...
Lime	·96	...	1·53	...	1·00	...	1·57	...
Magnesia	·31	...	·26	...	·55	...	1·75	...
Potash	·85	1·63	1·29	1·22	1·31	1·17	1·51	1·01
Sodium	·55	...	·29	...	·29	...	·27	...
Phosphoric anhydride† ...	·02	·15	·12	·10	·06	·12	·09	·12
Total ...	100·00	...	99·98	...	100·00	...	100·00	...
*Containing nitrogen	·09	·073	·091	·088	·091	·064	·134	·122
†Containing phosphoric anhydride soluble in 1 per cent. citric acid solution.	·014	...	·016	...	·005	...	·007	...

Rainfall and character of the season.

The following table shows in inches the average rainfall of Hooghly Sadar and the actuals recorded in the farm during the year under report :—

Months.	Average normal rainfall at Sadar (3 miles off).	Actual fall recorded in the year.		Comparison with normal.	
		Rainfall.	Number of days.	Excess.	Deficit.
1921.					
April	2·46	1·97	4	...	0·49
May	5·85	1·89	5	...	3·96
June	10·56	5·28	12	...	5·28
July	11·28	8·12	13	...	3·16
August	11·64	20·82	24	9·18	...
September	8·40	6·26	19	...	2·14
October	4·09	3·75	5	...	·34
November	0·66	Nil	...	...	0·66
December	0·19	Nil	...	...	0·19

Months.	Average normal rainfall at Sadaf (3 miles off).	Actual fall recorded in the year.		Comparison with normal.	
		Rainfall.	Number of days.	Excess.	Deficit.
1922.					
January	0·38	Nil	...	...	0·38
February	1·20	Nil	...	...	1·20
March	1·50	...	...	...	...

The season was very unfavourable for *aus* and *aman* paddies. The monsoon was unusually late having rain not being received until the third week of August. Long drought in July and the arrival of the monsoon delayed the transplanting of *aman* and as a matter of fact *aus* could not be transplanted at all and so the experiments with *aus* paddy had to be abandoned. Again, the deficient fall from September to November told heavily on *aman* paddy as the existing water storage areas were too insufficient to cope with the requirements. The *rabi* crops did not thrive well owing to the entire absence of any cold weather shower.

Operations during the year.

(1) Standardization of plots.
(2) Manurial experiment on nagra paddy.
(3) Field trial between Dudsar and Indrasail paddies.
(4) Seed production :—

(*a*) *Aus* paddy.
(*b*) *Aman* paddy.
(*c*) Jute.
(*d*) Sugarcane.
} New and improved varieties.

(5) *Rabi* crops.
(6) Other trials—

(*a*) Sunn hemp.
(*b*) Groundnut.
(*c*) Rahar.
(*d*) Cotton.

7. Trials with pure line varieties of paddy were conducted on 18·72 acres of land under the guidance of the Economic Botanist, and the result of these experiments will be found in his report.

(1) As in the four previous years the whole of the Block "A" was grown with Nagra paddy without any manure to test uniformity with a view to find out standardised plots. The average outturn of the different plots for five years show that the soils of the different plots are very variable. A few sets of uniform plots have now been marked out and these will henceforth be utilised for experimental work.

(2) *Manurial experiment with Nagra paddy.*—The object was to find out the merits of green manuring with Dhaincha as compared with cowdung, castor cake and I. O. P. cake on winter paddy (Nagra). The following table shows the respective outturns :—

Manures applied per acre.	Outturn per acre.				Average outturn per acre for the last three years.			
	Grain.		Straw.		Grain.		Straw.	
	Mds.	Srs.	Mds.	Srs.	Mds.	Srs.	Mds.	Srs.
Dhaincha green manure	18	33	27	30	26	6	29	39
Cowdung at 100 maunds	21	2	30	5	23	24	28	8
Castor cake at 3 maunds ...	21	4	29	16	22	9	26	30
I. O. P. cake ...	17	33	25	35	23	15	30	35
Unmanured ...	11	26	19	11	18	15	23	12

It has now been ascertained that Dhaincha green manuring gives the best financial results in years of normal rainfall and that cowdung at 100 maunds per acre comes next; castor cake is recommended only when reliable cake can be had at about Rs. 3-8 per maund.

B. An experiment was started during the year to compare results of annual, biennial and triennial applications of phosphatic manures on *aman* paddy (Nagra).

The table below shows the results obtained per acre from the application of the above manures on an area unmanured for five successive years :—

Phosphatic manurial series.

Grain.	Mds.	Srs.	Ch.	Remarks.
Unmanured	6	36	4	Average of 4 plots.
Bonemeal 3 maunds per acre every year	7	20	0	Do. of 2 do.
Bonemeal 3 maunds per acre every second year ...	11	20	0	Do. of 2 do.
Bonemeal 3 maunds per acre every third year ...	9	37	8	Do. of 2 do.
Rock phosphate every year 190 lbs. per acre ...	5	25	0	Result from a single plot.
Rock phosphate every second year	10	12	8	Do. do.
Rock phosphate every third year	8	20	0	Do. do.
Rock phosphate and castorcake at 2 maunds per acre—				
Every year	10	12	8	Do. do.
Every second year ...	5	25	0	Do. do.
Every third year ...	2	30	0	Do. do.

No conclusion can be arrived at until the experiment has been continued for at least three years.

3. Dudsar, a new variety raised by Economic Botanist, was tried against Indrasail on a field scale. Dudsar gave an outturn of 14 maunds 15 seers of grain per acre, while Indrasail in the adjoining plots gave 12 maunds 11 seers 10 chattaks per acre on an average.

Indrasail has now found a keen rival in Dudsar. The latter is several days earlier and is therefore possibly better suited to this tract.

Seed production.

4. (*a*) Kataktara *aus* paddy was grown on 10·65 acres for seed supply. Sowing was abnormally late for want of timely rains and so the crop had only a short period of growth. An average outturn of 11 maunds per acre was obtained.

(*b*) *Aman paddy*—

(*i*) *Indrasail.*—41·04 acres were under Indrasail for multiplication and supply of pure seeds to the several districts of the Western Circle. The outturn (15 maunds per acre) was very poor owing to late transplanting brought about by the late monsoon and deficient rainfall from September to November.

(*ii*) *Hatisal.*—It was grown 1·45 acres of high *aman* land. The crop fared badly for similar reasons and yielded a poor outturn.

(*iii*) *Nagra.*—About 41 acres were placed under Nagra for seed production. Due to the unfavourable season the crop did not thrive well and a low outturn of 13 maunds 20 seers per acre was obtained.

C. Jute.—Green olitorious was grown on 10·57 acres for seed production. Forty-one maunds 21 seers of seeds were obtained from the area. A small area was harvested rather earlier with a view to obtaining both seeds and fibre from the same crop. The fibres obtained are not of good quality. Two maunds 25 seers of jute seeds and 2 maunds 16 seers of fibre were actually obtained from ·6 acre.

D. Sugarcane.—1·2 acre was under different varieties of canes ratooned for three years and one acre under one year old ratoon. The Tanna variety did best.

5·7 acres were allotted for seed propagation and setts of the Tanna variety were supplied to various parts of the province. The demand for cuttings is still in excess of the supply.

Wheat.

(*i*) *Varietal test.*—Four varieties—Pusa 4, Pusa 12, Duram and Vulgare—were grown on ·0375 acre each, and the following table shows the outturn per acre :—

	Mds.	Srs.	Ch.
(1) Duram (local)	1	6	4
(2) Vulgare (local)	1	0	0
(3) Pusa 4	1	18	8
(4) Pusa 12	1	25	0

Pusa 4 was the earliest to mature.

(*ii*). *Irrigation experiment on Pusa 12*—The irrigated plots gave an outturn of 6 maunds 10 seers per acre, while the non-irrigated gave an outturn of 3 maunds 17 seers per acre.

Barley and Linseed were grown on one acre each and suffered from drought.

Gram grew fairly well.

Pea did not grow well and is not suitable for these heavy soils.

Miscellaneous.

6. (*a*) *Sunn hemp* was grown on 3 acres of land and an average outturn of 2 maunds 25 seers of fibre per acre was obtained. The crop was poor on account of late sowing.

(*b*) *Groundnut.*—A trial was made with the Spanish, Pondichery, Big Japan and Small Japan varieties. The heavy soil of this farm is not at all suited to this crop.

(*c*) *Rahar, Comilla Variety.*—The crop did fairly well and gave an outturn of 10 maunds per acre.

(*d*) *Cotton three varieties*—(i) Buri, (ii) Dharwar and (iii) Combodia—were grown. The picking of bolls is continuing.

Fruit Gardening Bananas.—A good many varieties of famous Rampal bananas were tried on the bank of the tank adjoining the office building. They grew fairly well. It is interesting to note that suckers of these varieties are in great demand in the locality.

Papaya.—The Ceylon and Poona varieties were grown. Both did exceedingly well and seeds of both is in good demand in the locality.

Miscellaneous Cattle.—There were 52 bullocks. Six died during the year under report of old age. A bull calf was presented by Mr. J. N. Gupta, Commissioner of the Burdwan Division, and a bull has recently been obtained from the Rangpur Cattle Farm. The present number of cattle is 48.

Seed Supply.—The following seeds have been supplied to the different parts of the province during the year under report :—

Sugarcane cuttings	82,500 setts.		
Indrasail paddy	103 mds.	36	srs.
Nagra paddy	137 „	2	„
Kataktara aus	236 „	9	„
Rahar	4 „		
Hatishal paddy	2 „	18	„
Chinsurah green jute seed ...	10 mds.		

Practical training in Agriculture.—Eighteen boys received a practical agricultural training during the year. Out of these, eight boys left of their own accord and the remaining ten boys have been sent out as demonstrators on completion of their training. This section will not close down as the Agricultural Secondary School started on the farm during the year will train demonstrators henceforth.

Visits and Inspections.—The Hon'ble Nawab Syed Nawab Ali Chaudhuri Khan Bahadur, C.I.E., Minister in charge of the Departments of Agriculture, Industries and Public Works visited the farm once during the year. The Director of Agriculture, Bengal, inspected the farm thrice during the year and the Deputy Director of Agriculture, Western Circle, Bengal, made frequent inspections. Dr. Aghor Kar, Professor of Botany of the University College, visited the farm with a batch of post-graduate students. The farm was also visited by the Economic Botanists of Bengal and Assam, the Commissioner of the Burdwan Division; Mr. Ganguly, University Professor of Agriculture, and Dr. M. N. Chaudhury. The farm was also visited from time to time by batches of cultivators and students from Chinsurah, Chandernagore and several other places.

Staff.—Babu Kshitish Chandra Guha held charge of the farm till October 1921, when he proceeded to Europe for higher agricultural training making over charge to Babu Raj Nath Roy, Head Master of the Agricultural School, since 29th November 1921.

Babu Chuni Lal Mustafi, Superintendent of Agriculture, has been placed in the charge of the Farm. He is assisted by one Superintendent, one Assistant Superintendent and three Overseers.

R. Das Gupta,

Deputy Director of Agriculture, Western Circle.

CHINSURA AGRICULTURAL STATION.

Financial Statement for the year 1921-22.

RECEIPTS.			EXPENDITURE.		
	Rs. A. P.			Rs. A. P.	
1. Total cash receipts during the year		9,030 0 5	Contingencies—		
Rs. A. P.			1. Purchase and feed of cattle		1,734 2 0
(*a*) Credited to Treasury 9,017 10 5			2. Seeds, manures and implements		657 9 0
(*b*) Received on afternoon of 31st March 1922. 12 6 0			3. Wages of labourers		15,504 6 0
			4. Petty construction and repairs		385 8 0
2. Value of supplies adjusted by book transfer		1,091 11 9	5. Service postage stamps		75 0 0
			6. Medical aid (no advice received from medical stores for supply made).		17 10 6
Total receipts during the year		10,121 12 2			
Deduct—Receipts on account of previous years		1,368 1 0	7. Rail and steamer freight		91 7 9
			8. Purchase and repair of furniture		100 0 0
Nett receipts for the year		8,753 11 2	9. Cooly and cart hire		22 10 0
			10. Office expenses and miscellaneous		1,477 15 3
3. Value of supplies treated as charge of the farm (under article 97, C. A. C.) ...		231 5 0	11. Hot weather charges		20 0 0
4. Bills receivable for 1921-22 outstanding on 31st March 1922		1,967 14 9	12. Botanical section work		500 0 0
5. Value of stock in hand on 31st March 1922 for disposal		3,164 6 0			
			Total Expenditure ..		20,586 4 6
Nett Receipts for the year ...		14,117 4 11			

APPENDIX IX.

ANNUAL REPORT OF THE BURDWAN FARM FOR THE YEAR 1921-22.

This is the oldest established farm in Bengal, having been opened in 1885 at the expense of the Burdwan Raj for experimental work. Up till September 1921 all expenses were borne by the Maharajadhiraja Bahadur of Burdwan, the management of the farm being in the hands of the Agricultural Department. In October 1921 it was made over to the Government of Bengal by the Hon'ble Maharajadhiraja. It is now under the direct control of the Bengal Agricultural Department and is being conducted as a Government district farm.

The farm consists of a narrow block of land with very irregular boundaries, situated at Pala, a village at a distance of about 4 miles to the south-east of the civil station of Burdwan. There being no fencing whatsoever, the crops are at the mercy of stray cattle and wild animals; it is needless to say therefore that fencing is urgently necessary. The presence of innumerable field rates is a source of great trouble to the crops in the fields and to the farm produce in the stores. The place being a hot bed of malaria, the Superintendent and the people working on the farm suffer much for nearly four months in a year.

Area.

The total area of the farm is 32 acres, of which 25 acres are under cultivation, comprising 4 acres of high sandy soil and 21 acres of low land. There is not much scope for trying experiments and demonstration with upland crops.

Soil.

The soil is a poor sandy loam. The analysis of the soil given below shows that it is very deficient in nitrogen, phosphoric acid and lime while it is fairly rich in potash :—

Table I.

	Soil, first 9 inches.	Sub-soil, second 9 inches.
Insoluble silicate and sand ...	88·52	87·47
Ferric oxide	3·60	3·68
Alumina	4·42	5·27
Lime	·34	·33
Magnesia	·34	·31
Potash	·31	·32
Soda	·09	·07
Phosphoric acid	·02	·03
Sulphuric acid	·01	·01
Carbonic acid	·04	·06
Organic matter and combined water	2·31	2·45
	100·00	100·00
Available potash	·04	·02
„ phosphoric acid ...	·002	·001
Nitrogen	·011	·007

Irrigation and Drainage.

The Eden Canal, which runs along the southern part of the farm, affords ample facilities for irrigation. The natural drainage of the farm is good, but when the water in the canal rises above the farm level during high floods, it becomes a source of great trouble as there is no other outlet for the water. During the year the farm crops suffered much from the ingress of the canal water through the numerous holes in the bund.

The farm had to pay the following water rates during the year under report :—

	Rs.	A.	P.
For *Bhadoi*, 1920-21 and 1921-22	60	0	0
„ *Rabi*, 1918-19, 1920-21 and 1921-22 ...	11	13	6

This rate varies according to the area of land and nature of crops grown and their outturn.

Rainfall and character of the season.

The following table shows the rainfall during the year. The season was unfavourable for paddy, the insufficient rain in October and total failure of rain in November greatly affecting the outturn :—

Table II.

Months.	Actual, 1921-22.		Normal, 1921-22.	
	Rainfall in inches.	Number of rainy days.	Rainfall of 40 years.	Rainy days of 40 years.
April 1921	2·41	9	2·20	3
May ,, ...	4·96	5	5·56	6
June ,, ...	10·08	17	10·70	12
July ,, ...	8·77	10	12·32	15½
August ,, ...	17·61	20	11·49	15
September ,, ...	11·40	15	8·59	11
October ,, ...	1·14	5	3 93	4
November ,, ...	Nil	Nil	0·64	¾
December ,, ...	Nil	Nil	0·13	¼
January 1922	Nil	Nil	0·38	¾
February ,, ...	Nil	Nil	0·89	1½
Total ...	56·37		56·83	

Operations of the year.

The programme of work undertaken included :—

(1) Varietal test with *aus* and *aman* paddies.
(2) Seed production—(*a*) *Aus*, (*b*) *Aman*, (*c*) Jute, (*d*) Sugarcane, (*e*) Dhaincha and (*f*) Cotton.
(3) *Rabi* crops, including potatoes.
(4) Other trials—(*a*) Groundnut, (*b*) Rahar and (*c*) Cotton.

1.—Varietal Test.

A.—An experiment was conducted for the second time to determine the comparative yield of Kataktara *aus* and local Newali. The results obtained are greatly in favour of the local variety. But nothing can definitely be said about the superiority of the local *aus* paddy, unless it has been tried for some years more.

The results obtained are given below :—

Table III.

Name of variety.	Average outturn per acre.				
	Grain.		Straw.		
	Mds.	Srs.	Mds.	Srs.	Ch.
Kataktara	13	12	27	11	8
Newali	17	11	36	6	10

B.—The following varieties of *aus* and *aman* paddies were tried under the guidance of the Economic Botanist .—

(1) *Kataktara* was tried against the local variety of *aus* named *Newali*. From the results given below it will be seen that *Newali* yielded better than *Kataktara* : —

Table IV.

Varieties tried.	Average outturn per acre.				
	Grain.		Straw.		
	Mds.	Srs.	Mds.	Srs.	Ch.
Kataktara	7	14	13	14	0
Newali	11	32	23	9	4

(2) Varietal experiment, to find out the outturn and suitability to this locality and the difference between local and other *aman* paddies, was made in three different groups, viz., (*a*) *Nagra* and *Indrasail*, (*b*) *Dudkalma* and *Jatakalma* and (*c*) *Karticsail* and *Jhingsail*, each, on $\frac{1}{10}$th acre in five duplications in the same block.

The results embodied in the following statement speaks for the superiority of *Jhingsail* and *Nagra* varieties :—

Table V.

Varities tried.	Average outturn per acre.			
	Grain.		Straw.	
	Mds.	Srs.	Mds.	Srs.
Indrasail	30	13	48	15
Nagra	32	10	43	5
Dudkalma	28	18	46	21
Jatakalma	31	16	48	24
Karticsail	23	4	31	24
Jhingsail	34	6	50	33

Seed production.—(*a*) *Aus* paddy 0·5 acre were cropped with *Kataktara*. An outturn of 8 maunds 19 seers of *Kataktara* was obtained per acre.

(*b*) *Aman paddy.*—2·1 acres were put under *Indrasail* and 3·7 acres under *Nagra*, for propagation of seeds. An outturn of 19 maunds 12 seers 13 chattaks and 21 maunds 4 seers 9 chattaks per acre respectively was obtained.

(*c*) *Jute.*—The Olitorius variety Chinsura Green was grown on 1·15 acres of land for seed production. The transition from a private to a departmental farm and the consequent want of funds at the juncture affected harvesting at the proper time and a good part of the seeds were lost through shedding.

(*d*) *Sugarcane.*—An area of 2 acres was used for the multiplication of Yellow Tanna. The results obtained were very poor. The total outturn of *gur* from this area of 2 acres was 60 maunds, besides about 20,000 cuttings. These discouraging results are entirely due to the situation and texture of the soil, which is a low land of sandy nature. The crop suffered badly from drought at the early stage, while during the monsoon it was greatly affected by the ingress of the canal water.

Rabi crops.

3. Small areas were put down under gram, lentil, pea, mustard and linseed. Of these, mustard was a total failure, all plants dying on account of drought in October. It is expected that *rabi* crops may be profitably cultivated in this locality, if means of irrigation can be provided.

Potatoes.

An area of ·4 acre was planted out with this crop with two varieties—Darjeeling and Naini Tal. The former occupied ·3 acre and the latter ·1 acre, respectively. They yielded 51 maunds 13 seers and 14 maunds 28 seers respectively.

Other trials.

4. (*a*) *Groundnut.*—A trial was made between Big Japan and Pondicherry. White ants and field rats destroyed the crop to a considerable extent, ·20 maund of Big Japan and 12·20 seers. of Pondicherry per acre were obtained.

(*b*) *Rahar.*—The brown and white varieties of Comilla rahar were grown side by side for determining their comparative yield. The white variety yielded better.

(*c*) *Cotton.*—Cambodia and Dharwar varieties of cotton were tried on ·10 acre each. The results obtained are not satisfactory as the plants suffered much from heavy rains in their early stage and drought later on. Moreover the sandy nature of the soil on which the crop was grown affected its yield. On the whole the Dharwar fared better than Cambodia. Up to date 5 seers 4 chittaks of Cambodia and 5 seers 7 chittaks of Dharwar have been picked while many bolls are yet to mature.

Miscellaneous.

Cattle.—The farm has only 8 bullocks, of which two are very old and infirm and one is blind and unfit for work. It is absolutely necessary to replace them. The general condition of the stock on the whole was good. The number of casualties was only one during the year under report. It was due to old age.

Visits and inspections.

The Deputy Director of Agriculture, Western Circle, and the Superintendent of Agriculture, Burdwan Division, inspected the farm frequently. The farm was also visited by the Assistant to the Economic Botanist to the Government of Bengal.

Establishment.

There have been constant changes in this respect. Babu Atul Chandra Bose was in charge of the farm up to 5th October 1921. Then the management of the farm was under Babus Dinesh Chandra Mazumder, Nilratan Roy, Abala Ranjan Ray, Jibendra Nath Chatterjee, in succession, for short periods. Babu Abala Ranjan Roy is at present in charge of the farm.

R. DAS GUPTA,

Deputy Director of Agriculture, Western Circle.

Receipts and expenditure of the Burdwan Farm for the year 1921-22.

RECEIPTS.				EXPENDITURE.			
	Rs. A. P.	Rs. A. P.	Rs. A. P.	*Under Burdwan Raj.*	Rs. A. P.	Rs. A. P.
Receipts as opening balance ...		17 3 6		Establishment	384 8 0	
Burdwan Raj grant ...	...	2,800 0 0		Travelling allowance	126 3 0	
Sale proceeds remitted to Treasury.	...	147 0 9		Purchase of seeds	83 0 3	
Bills outstanding on 1st October 1921.	41 6 0	21 8 0		Feed of cattle	99 2 3	
Deduct—Amount written off	19 14 0			Purchase of manures	214 14 0	
		2,985 12 3		Purchase and repair of implements	43 3 3	
Deduct Receipts of previous years.	...	164 0 6		Wages of farm labourers	1,509 6 1	
			2,821 11 9	Petty construction and repairs ...	23 11 0	
				Railway freight	21 3 0	
				Postage and stamps	8 4 0	
				Rents, rates and taxes	50 12 6	
				Miscellaneous expenses	131 1 6	
					2,695 4 10	
Sale proceeds credited to Treasury.	...	1,264 1 8		Balance ...	126 6 11	2,821 11 9
Bills outstanding	...	82 1 6				
Value of stock on 31st March 1922.	...	466 0 0		*Under Government.*		
			1,812 3 2			
				Establishment	350 12 0	
				Travelling allowance	136 3 6	
				Feed of cattle	69 2 0	
				Purchase of seeds	35 8 3	
				,, of manure	36 0 0	
				,, and repairs of implements	78 14 6	
				Wages of farm labourers	1,517 3 9	
				Petty construction and repairs ...	25 0 0	
				Railway freight	2 4 0	
				Postage stamps	16 5 0	
				Rents, rates and taxes	38 1 0	
				Miscellaneous expenses	106 7 6	
					2,411 13 6	
				Loss ...	599 10 4	
					1,812 3 2	1,812 3 2
		Total ...	4,633 14 11			4,633 14 11

APPENDIX X.

ANNUAL REPORT OF THE GOSABA FARM FOR THE YEAR 1921-22.

Introduction and brief history.

The farm was opened in the year 1920. It is owned by Sir Daniel Hamiton, Kt., who bears the expenses, the management being in the hands of the Agricultural Department.

The farm originally comprised a compact block of land measuring about 30 bighas, but 10 bighas has been taken away this year and leased to the tenants, leaving only 20 bighas for the farm. It is situated in the Sundarbans alongside the river Bidya and is 28 miles away from the Canning Station by river. Of the total area, 17 bighas are under cultivation, the remainder being under farm office buildings, cattle-shed, farm yard, roads, etc.

The sanitary condition of the farm is not satisfactory. There is no good reserve tank for drinking water and rain water stored during the rainy season, serves the purposes of drinking water. In the dry season, when there is scarcity of rain water, cholera breaks out and takes a number of lives.

Object of the farm.

Paddy being the staple crop in the Sundarbans, the tenants of the Sundarban tracts confine themselves to the cultivation of paddy alone. The main object of the farm is to ascertain by experiment whether any other valuable crop, such as jute, sugarcane, potatoes and wheat, etc., can be grown in addition to paddy, as well as to demonstrate to the tenants improved and scientific methods of cultivation.

Fencing.

The farm having no permanent fence, it is very difficult to protect the crop (specially *rabi* crop) against stray cattle. The tenants let loose their cattle just after paddy harvesting, *i. e.*, by the middle of January, and these cattle graze in the fields, uncared for and unrestricted, till the month of June next. Without a permanent and strong fence round the farm no careful experiments can be attempted.

Houses.

There is a pucca building with *golpata* roofing, having two rooms and verandah on all sides and a small separate building for kitchen, as also a pucca cowshed. If this building is used as office, there is no arrangement for the quarters of the officer in charge of the farm. And if it is used as family quarters of the officer, as it was intended to be, then there ought to be a separate house for the office of the farm.

Laying out.

The farm has not been laid out into plots systematically as yet.

Drainage.

There is a good drainage system in this tract. A drain has been cut across the road on the northern side of the farm and has been connected with a khal, the water of which is drained through a sluice gate. One of the great advantages of cultivating paddy in this tract is that excessive rain cannot inundate fields as each island is provided with many such sluice boxes for the exit of water. Heavy rains, on the other hand, prove highly beneficial so far as paddy cultivation is concerned as they tend to remove salt.

Irrigation.

There are no irrigation facilities in the farm, and it has to depend entirely on seasonable showers. Ditches should be excavated through the centre of the farm for holding up the rain water which might be utilised in cases of extreme necessity, and all the available earth utilised for the purpose of raising the fields. This would afford us a series of highland plots.

Soils.

The samples of soil and sub-soil of both high and low lands have been sent to the Agricultural Chemist to the Government of Bengal, Dacca, for analysis. The result is awaited with keen interest.

Rainfall and character of the season.

Formerly there was no system of registering rainfall, but the Meteorological Department has now supplied a rainfall register guage. And since May last a regular register is being kept for registering daily rainfall. This is a great help specially here as every crop depends upon rainfall. Below is the table showing local rainfall month by month.

The total rainfall for the last 11 months ending March 31st is 41·92 inches, which is much less than the average rainfall :—

	Actual rainfall in inches during 1921-22.	Actual number of rainy days during 1921-22.
1921.		
May	1·07	2
June	11·20	21
July	8·65	24
August	11·99	29
September	7·53	21
October	1·48	4
November	Nil	Nil
December	Nil	Nil
1922.		
January	Nil	Nil
February	Nil	Nil
March	Nil	Nil

The weather was not favourable on the whole. For want of timely rain the transplanting was greatly delayed. An unusually high tide in August (the highest ever recorded 21′ 6″) broke through the bund and inundated the farm land with salt water, thereby severely damaging the crop.

Operations during the year.

(1) Varietal test with *aman* paddy.
(2) *Aus* paddy.
(3) Jute.
(4) Sugarcane.
(5) Dhaincha and sunn hemp.
(6) Rabi crops—(*a*) Wheat and oat.
(7) Other trials—(*a*) Cotton and groundnut.

(1) *Aman paddy (Indrasail).—Indrasail* was tried against the two well-known local varieties of *aman* named Patnai and George. The outturn was very low due to the shortage of rainfall and the flood at the high tide in August. This experiment will be repeated next year.

(2) *Aus paddy*—Economic Botanist's *Kataktara aus* paddy was tried here on a very small scale. The crop totally failed owing to the depredations of small birds known as *Monua* and others, which are very abundant here. The land here is fairly suited for growing *aus*, but these birds preclude the successful cultivation.

(3) *Jute.—Kakya bombai* was tried on $\frac{2}{15}$ of an acre (·13) of land for fibre. ·57 lbs. of fibre were obtained.

(4) *Sugarcane.*—Yellow Tanna was tried in the estate garden, but the growth was rather stunted, due to salt in the soil. The cane is not fit for making *gur* as yet.

(5) *Dhaincha and Sunn hemp*—Dhaincha was also tried on a very small scale for seed production, but the outturn was not satisfactory this year. The sunnhemp crop failed this year.

(6) *Rabi crops.*—(*a*) This is the first year that *rabi* crops (wheat and oats) have been tried in this farm as an experimental measure, but the crops were much damaged by stray cattle. The attempt to grow *rabi* crops should be totally given up until the farm has been provided with a strong fence to keep off the stray cattle and buffaloes.

(7) *Other trials.*—(*a*) An attempt was made also to grow cotton and groundnut, but it was not successful owing to the presence of salt in the soil.

Miscellaneous cattle.

There is only one pair of bullocks in the farm and another pair is required urgently, otherwise work will suffer in the coming season. The general condition of the stock is satisfactory. The farm has got one Ayrshire bull and one cow. The herd is under the direct control of the Estate.

Construction.

A pucca threshing floor is required for threshing seeds, etc.

Implements.

In addition to country ploughs the following implements are required for the farm—Punjab plough, five tinned spring toothed harrow, and planet junior hand hoe—one of each variety.

Visits and Inspection.

The Superintendent of Agriculture, Presidency Division, Bengal, inspected the Farm once during tho year. The farm was also visited by the Subdivisional Officer, Basirhat, and the Registrar Co-operative Soieties, Bengal. *Bonâfide* cultivating and farming classes attended the farm occasionally.

Acknowledgment.

I am much indebted to Babu Sudhansu Bhusan Mazumdar, Manager of the estate, for his co-operation and sympathetic help.

Establishment.

Babu Sukesh Chandra Banerjee was in charge of the farm till the 28th October, when took over charge on his taking leave from the 29th October 1921.

R. Das Gupta,

Deputy Director of Agriculture, Western Circle.

GOSABA AGRICULTURAL STATION.

Financial Statement for the year 1921-22.

Receipt.	Amount. Rs.	A.	P.
Total amount credited to Estate ...	509	10	3
Value of articles made over to Estate	4	0	0
Bills outstanding	2	14	0
Value of stock on 31st March 1922	3	7	0
Total ...	519	15	3

Expenditure.	Amount. Rs.	A.	P.
Wages of labourers	286	8	0
Railway freight	10	5	0
Purchase of seeds	21	5	6
Do. manures	23	11	0
Do. implements ...	8	4	0
Do. stationery ...	4	8	0
Furniture	32	8	6
Miscellaneous	2	9	9
Total ...	389	11	9

APPENDIX XI.

ANNUAL REPORT OF THE BERHAMPORE FARM FOR THE YEAR 1921-22.

Introduction.

The present Berhampore Farm was during the days of the East India Company a pleasure garden. Grafts of rare mangoes and lichees were planted and even to-day some of these remain although now suffering from age. This garden was transferred to the Agricultural Department for the cultivation of mulberry and a portion of the land was lent to the District Agricultural Association for conducting Agricultural Demonstrations. In the year 1921 the garden was finally selected as the site for the district farm. About 20 bighas to the north was set apart for mulberry cultivation. Reclamation work on the remaining area could not be commenced till late in August 1921, and, as a result, proper levelling of lands could not be completed. The front portion of the farm is low lying and the land surface was very uneven in the centre. This portion has been properly levelled down and has been divided into 1-10th acre plots.

Half of the old sericultural bungalow has been utilised as the farm office, leaving the other half for the farm demonstrator to live in. Four labourers' quarters, one demonstrator's kitchen-shed, and one cattle-shed have also been erected on a temporary basis.

Area.

One hundred and twenty-six bighas, out of which about 35 bighas were reclaimed and made ready for cultivation during the year under report. The levelling work is not however complete. Details of the area cultivated during the year under report are given below :—

For experimental investigation	...	...	...	1·2 acres.
For varietal demonstrations	...	...	...	1·4 „
For fodder and odd cultivation	...	...	...	3·5 „

Site.

The farm is excellently situated within the Berhampore Municipality on the Kasimbazar Road and within the easy access of the people. It has also got excellent facilities for irrigation being surrounded on three sides by bheels and tanks.

Soils.

The soil of the farm is a rich loam. The sub-soil below the depth of 5 feet is rather more sandy.

Object.

The objects of the farm are—

(1) To conduct varietal lists of our departmental seeds against local seeds.
(2) To conduct irrigation experiments on *rabi* crops.
(3) To conduct manural and other experiments on sugarcane.
(4) To render assistance to private farms, co-operative agricultural Societies, etc., by way of supplying pure seeds.
(5) To demonstrate the utility of economical pumping plants.

Rainfall and weather.

The attached statement gives the rainfall of the town during the year under report :—

Months.				Total rainfall in the month in inches.	Number of days.
April	...	...	...	3·12	6
May	...	...	...	0·18	4
June	...	...	...	13·92	17
July	...	...	...	8·69	11
August	...	...	...	16·63	25
September	...	...	...	7·16	11
October	...	...	...	1·53	2
November	...	...	...	...	...
December	...	...	...	...	...
January	...	...	...	...	...
February	...	...	...	...	...
March	...	...	...	...	...
		Total	...	51·23	76

Crops.

Owing to late commencement of operation the croping scheme was confined to *rabi* crops. Gram, oats and peas were grown to odd corners of the farm. One set of irrigation experiments on Pusa 12 wheat and local Gangajali wheat was conducted on 12 series of plots each measuring 1-10th acre. Owing to the uncover condition of the soil the crops were never uniform throughout the plots, but each individual plot clearly showed the effects of irrigation or otherwise. The *masur* was sown very late owing to difficulty of obtaining bold-seeded variety of seeds from Bihar.

Experimental work.

The following experimental works were conducted during the year under report :—

(1) Wheat Pusa 12 *vs.* Gangajali Irrigation Experiment.
(2) *Masur* Local *vs.* Barisal.
(3) Potatoes Local *vs.* Darjeeling. (Results will be submitted after harvest.)

Visits and Inspections.

The Director of Agriculture and the Deputy Director of Agriculture, Western Circle, Bengal, visited the farm several times. The farm was also honoured by the visit of the Hon'ble Minister of Agriculture in January last where the members of the District Agricultural Association met him with an address of welcome. The Collector of the District and the Chairman of the District Board also visited the farm several times.

Charge and Staff.

Babu N. Majumdar, District Agricultural Officer, held the charge of the farm throughout the year under report. Babu Ashutosh Das Gupta, a fieldman demonstrator, was appointed in August 1921 to assist him in his farm work.

Receipts and Expenditures.

The table below gives the receipts and expenditures of the farms during the year under report :—

Receipts.	Rs.	A.	P.	Expenditures.	Rs.	A.	P.
Sale proceeds of the farm produce (up to 15th March 1922) ...	67	0	0	Establishment	238	8	1
Bills outstanding on 15th March 1922	Nil			Petty construction and repairs ...	258	8	6
Value of stock in hand (15th March 1922)	Nil			Purchase of cattle	375	0	0
				Cattle food	9	9	6
				Wages of labourers ...	203	3	4
				Reclamation	988	2	9
				Fencing	305	5	6
				Cultivation	145	2	0
				Seeds	96	12	9
				Manures	46	11	3
				Implements	34	0	0
				Municipal taxes	47	5	6
				Railway freight	28	8	0
				Miscellaneous	64	14	3
Total ...	67	0	0	Total ...	2,841	11	5

R. Das Gupta,
Deputy Director of Agriculture,
Western Circle.

APPENDIX XII.

ANNUAL REPORT OF THE DACCA CENTRAL FARM, 1921-22.

Brief History.

The site of the farm was selected in December 1906 by Rai B. C. Bosu Bahadur, and was approved after inspection by Sir Bampfylde Fuller, then Lieutenant-Governor of Eastern Bengal and Assam, and Mr. (now Sir) Frank Sly, then Inspector-General of Agriculture.

Besides serving as an experimental station, the farm is the headquarters of the Expert staff of the Department, and the Research Laboratories are situated in the farm area.

Description of the Farm.

The farm comprises a compact block of land, 353·7 acres (1070 bighas) in area, situated between the Mymensingh and Mirpur Roads, 5 miles to the north of Dacca Railway station, near the village of Manipur. A new railway station has been opened at Teggaon (*v*) close to the boundary. The land was acquired at a cost of Rs. 70,043, and at the time of acquisition was chiefly occupied by thatching grass, scrub jungle and mango topes, only a small portion being under cultivation. A large area of jungle has since been reclaimed and the land levelled and laid out into regular fields. At present 215 acres are cultivated, the remainder being under roads, building and pasture. About 70 acres of cultivation are under the control of the Expert, the remainder being worked by the farm.

Soil.

The soil of the farm is a stiff red laterite typical of a considerable tract, including the Madhupur jungle and the "barind" of the Rajshahi Division. In the dry season the red clay sets hard like cement and the soil loses moisture rapidly. It is deficient in organic matter and very poor in phosphoric acid and lime. The soil of the low lands is more productive than that of the high land owing to continuous deposits and washings from the latter.

The low land is suitable for transplanted winter paddy, whilst jute, *aus* paddy, sugarcane, etc., are grown on the high land.

Buildings.

As reported last year twenty members of the farm and laboratory staffs are still without accommodation. The building of seven sets of quarters was administratively approved in 1919 but up to the present they have not been built. This has caused much inconvenience to the staff, and is in addition resulting in an immense loss of time and work.

Season.

The season was favourable for jute and *aus* paddy and favourable for *aman* paddy and sugarcane up to October when drought set in.

Late transplanted paddy suffered from lack of moisture at flowering time as there was no rain in the latter part of October and the sugarcane required irrigation in November and December, actual figures for rainfall will be found in Appendix A.

Operations during the year.

	acres.
Crops—	
High land cultivation	147
Low land cultivation	66
Fallow including tanks Buildings and Agricultural School (10 acres) }	101
Roads and drains	39
Total ...	353
Crops in 1921—	
Aman paddy under farm	40
Aus paddy under „	37
Sugarcane under „	6·83
Maize and cow peas „	4·66
Juar	4·50
Dhaincha	2·00
Jute	5·33
Cultivation under the Experts	63·61
Total ...	163·93

At the present moment only *aman* paddy is being grown economically. All other crops are uneconomical for the simple reason that the land is waste land and most of it would go back to jungle again if we left it. Some portion of it could grow *aus* paddy economically but I doubt whether any other crop would pay expenses.

The following definite results were obtained in 1921 :—

	Total area.	Total yield.	Yield per acre.
	Acres.	Mds.	Mds.
Aman paddy	40	841½	21
Details—			
Indrasail	30½	681	22⅓
Dhepi	1⅓	25	17
Dudsar	6·9	105	15¼
Tilakkacheri	1¼	32½	26
Individual Returns—			
Indrasail	·57 / ·69	31 / 26	average 28½
Dhepi	·62 / ·73	20 / 16	„ 18
Dudsar	·51 / ·73	28 / 20½	„ 24¼
Tilakkacheri	·55 / ·67	27¼ / 26	„ 26½

From the practical point of view *Indrasail* maintains its superiority as a yielder in 1921.

From the above it will be seen that a good supply of *Indrasail* (600 maunds) pure seed was made available on this farm for distribution throughout this circle. See Appendix B for further details. Appendix C gives the results obtained by irrigation on *Indrasail*.

Aus Paddy	Total area.	Total outturn.	Yield per acre
	Acres.	Mds.	Mds.
Aus paddy—			
Aus paddy	37	552½	15
Details—			
Kataktara	35⅓	540¾	15⅓
Charnock	1⅓	11¾	9
Surjamukhi		failed.	

There is no doubt that *Kataktara* is the best *aus* paddy for single cropped land on the farm. It is necessary to point out however that *Kataktara* is not an *aus* paddy suitable for rotation with *aman* on the same land in the same year, as it occupies the land too long. A supply of 500 maunds of pure *Kataktara* seed was obtained for distribution purposes.

All other crops are in the experimental stage. Sugarcane is under the control of the Agricultural Chemist and for information on all crops under Experts, their reports should be consulted.

Aus paddy.—Excepting a small plot of Charnock, the farm grew only *Kataktara* for seed. As in previous years great difficulty was experienced at harvest time owing to incessant rain and insufficient godown accommodation. This difficulty will continue so long as an efficient threshing machine is not available.

Transplanted paddy.

Indrasail was grown as the main crop but as *Dudshar* from the previous year's experiments was considered promising on intermediate land, on account of its earlier ripening habit about five acres were put down. Unfortunately it was badly attacked by a disease which *Tilakkachari* and *Indrasail* resisted better. The results of the variety tests will be found in the appendix.

Two new manurial experiments were started this year. One was to test the comparative values of bonemeal and rock-phosphate with or without lime and to find out whether phosphates induce early ripening and resistance to drought. The results obtained were not consistant and the experiment will be continued. The other experiment was to test the value of irrigation on transplanted paddy. The result will be found in the appendix.

Sugarcane.

The work of testing varieties was continued as in previous years under the guidance of the Agricultural Chemist. Yellow *Tanna* and *Hemja* were grown on a large scale for multiplication.

The canes on this farm even when fully ripe contain a very large amount of glucose (3 to 5 per cent.). The same canes when grown on the alluvium do not contain more

than 1 per cent. of glucose. The soil of the farm is acid and as the canes are usually grown without irrigation the canes suffer from drought during November and December. It was therefore thought that the high percentage of glucose might be due either to the acidity of the soil or to the premature ripening of the canes due to lack of moisture. Irrigation was therefore tried on four plots. The results which will be found in the appendix show a considerable diminution in the precentage of glucose in the irrigated plots. As however the percentage of glucose still remains high the Agricultural Chemist proposes to try next year the effect of manures. Early planting with irrigation will also be tried to find out the best time for planting cane on this farm. See Appendix D.

MacGlashan's furnace was tried with marked success. It consumes less fuel and boils the juice more rapidly than the old type of furnace that has been in use on this farm and elsewhere for a long time. This furnace has also been adapted to the boiling of date palm juice.

Jute.

The results of experiments with jute will be found in the report of the Fibre Expert to the Government of Bengal.

Rabi crops.

Wheat.—The soil of this farm has repeatedly been proved to be unsuitable for *rabi* crops. A further attempt was made this year to grow *rabi* crops with irrigation. Wheat was grown with and without irrigation. Though the irrigated wheat showed over 66 per cent. increase in the yield, the cost of irrigation was not covered by the increased yield.

Tobacco.

Varietal and manurial experiments with tobacco were tried this year. The results are not yet available. This work is being done in collaboration with the Agricultural Chemist.

Potatoes.

Rather late in the season it was decided to grow two small plots of Darjeeling and Italian potatoes. Potatoes never did very well on this farm even when grown with irrigation. They also suffered from fungus diseases. This year the potatoes were manured only with liquid manure and the results obtained were remarkable in more than one way. Though planted rather late they gave a very high outturn for the red soil. They were also comparatively free from fungus diseases. Liquid manure tried on winter vegetables gave equally good results. At present there is no special arrangement for conserving and using liquid manure and this is a matter that requires attention and a little capital outlay would be quite justified.

Implements.

The Glasgow Tractor has not yet proved its utility. Nothing can be said definitely about it till a competent mechanic and driver is obtainable. A plough and a disc harrow for the tractor have been purchased but could not be fully utilized for the above reason. The Osh-Kosh pump inspite of frequent break downs was able to do all the irrigation required of it. As power plants are likely to be used increasingly in the future the need for a competent mechanic is becoming every day more urgent.

The Mohte continued to do good work. Both bullocks and men have now been trained to work it. Its work has been further facilitated by fixing up an iron stage provided with a large pulley and steel iron rope.

Dairy.

The Sindhi herd has not deteriorated in damp Bengal as was apprehended. The milk record has increased and six calves (five heifers and one bull), were born during the year. The main difficulty is in providing green fodder during the dry season. It has yet to be proved that milk can be produced economically on this farm under present conditions as the red soil is not suited to the production of fodder corps. See appendix E.

Farm cattle.

Ten pairs of new bullocks were purchased from Sonepur fair by the Superintendent, Civil Veterinary Department, Bengal, for this farm and three more pairs were purchased locally. Thirteen died of old age and one of Hæmorrhogie Septicæmia. More cattle are needed but could not be purchased for want of funds.

Practical training in agriculture.

Fifteen young men received training during the year, as farm labourers. It is expected that all demonstrators in future will be recruited from the successful students of the Agricultural School which has now been raised to a higher standard.

Agricultural Vernacular School.

This school finished its final year's work during the period under review. It has since been converted into a higher Agricultural School mainly for training demonstrators for the Department. Some of the boys came under false pretences. They really want Government service although they said they wished to return to their villages to work their own land. Although we did our best to select likely candidates, it is a great struggle to get them to do practical work and they take every opportunity to get holidays although the holidays granted officially are in my estimation far too many. This school was under me during the year. The accounts are separate from those of the farm and a separate detailed report is submitted elsewhere. Mr. P. K. Biswas was the Head Master in charge. He worked well but requires to be more practical and impartial, if he wishes to turn out practical workers who will be of any use to this department.

Visitors.

His Excellency the Governor visited the farm in August as usual. The Hon'ble Minister of Agriculture and Industries visited the farm twice also the Hon'ble Minister of Education, and the Hon'ble Sir F. White, President, Indian Legislative Assembly and Mr. Milligan, the Agricultural Advisor to the Government of India, in addition to many others.

Conference.

The Annual Panchayati Conference was held on the 24th February 1922. Practical demonstrations of irrigation with the Osh-Kosh pump and Mohte and also of butter-making, *gur*-making and cigar-making were given. The visitors were also shown the tobbcco, sugarcane and wheat experimental plots. His Excellency the Governor addressed the meeting at the conclusion of the conference.

Establishment.

I was nominally in charge throughout the year. This period saw some important changes in the establishment. An officer of the Provincial service was placed in charge of the Farm from May 18th as the Chief Superintendent, Babu T. N. Roy was appointed to this post. M. A. Jalil continued to act as Farm Superintendent. Babu Amrita Lal Mukherjee, officiating Assistant Farm Superintendent, was transferred to the Burirhat Farm in June 1921 and Babu Abani Mohon Das has since been acting as Assistant Farm Superintendent. All worked well. The three Overseers, K. C. Bhattacherjee, G. P. Mukherjee and I. Hossain, also worked well.

Receipts and Expenditures.

The receipts were Rs. 8,071-0 as against Rs. 4,927-2-3 of the previous year. This includes nothing from Experts.

The expenditure incurred amounted to Rs. 45,661-7-3 inclusive of capital Expenditure, laying out, repairs, etc., as against Rs. 55,948-1-8 of the preceding year. This amount includes over Rs. 1,000 for repair of houses of the Laboratory staff. Over Rs. 1,000 for a new road, over Rs. 1,000 for ploughs for the Tractor which must be considered as experimental work and Rs. 3,400 for the work done by the Expert staff. Bullock labour and manure is also supplied to the Expert staff.

Dacca Farm Seed Stores.

This seed store is an arrangement on the Dacca Farm for dealing with the big consignments of seed for the whole Province. 838¾ maunds of jute seed were dealt with during the year as well as 121½ maunds of *Kataktara aus* and 41,150 *Tanna* cuttings. See Appendix F. for details.

Kulada Kanta Sen was in charge of this work under the immediate supervision of the Chief Superintendent and worked well.

F. SMITH,

Deputy Director of Agriculture,
Eastern Circle.

Table showing rainfall for each month in Comparison with the normal.

Months.	Normal.		Actual.	
	Rinfall in inches.	Number of rainy days.	Rainfall in inches.	Number of rainy days.
1921.				
February	1·12	1·80	Nil	Nil
March	2·59	3·50	9·14	5
April	4·88	6·70	7·79	8
May	9·60	11·30	5·47	7
June	13·38	15·20	20·48	17
July	12·85	15·75	13·37	20
August	12·55	17·40	9·13	19
September	9·43	11·40	10·98	10
October	4·91	5·00	2·84	3
November	·81	1·10	Nil	Nil
December	·15	·40	Nil	Nil
1922.				
January	·38	·90	Nil	Nil
Tatal for the year ...	72 65	90·45	79·20	98

Table showing results of varietal tests in East Ravine, 1921-22.

Name of variety.	Area of plots in acre.	Outturn per acre in lbs.		Average outturn per acre in lbs.	
		Grain.	Straw.	Grain.	Straw.
Indrasail ...	·17	1,901	4,540		
	13	2,269	5,338		
	·09	2,038	4,518	2,077	4,281
	·11	2,480	3,384		
	·11	1,873	3,472		
	·08	1,907	4,268		
Dhepi* ...	·21	1,068	2,326		
	·14	1,093	3,042		
	·12	1,300	2,708	1,298	2,891
	·11	1,253	2,838		
	·07	1,086	2,628		
	·08	1,564	2,722		
Dudhsar* ...	·20	1,526	3,718		
	·17	1,603	3,156		
	·08	1,577	4,810	1,636	3,858
	·07	1,390	2,882		
	·07	1,320	3,458		
	·14	1,377	3,382		
Tilakkachari ...	·19	1,871	5,540		
	·11	2,123	2,968		
	·10	1,735	4,054	2,069	4,739
	·08	2,257	5,864		
	·11	2,411	4,786		
	·08	2,224	5,026		

* As a large number of plants were up rooted and burnt from the *Dhepi* and *Dudhsar* plots under the instruction of the Mycological and Entomological Assistants the outturn of these has to be corrected according to the number of plants destroyed. The loss thus occasioned is calculated at 8 and 9 per cent., respectively. The corrected figures are shown in the column for average outturn.

Table showing the results of Irrigation Experiments in Yellow Tanna cane Old South Hazl, 1921-22.

Number of Irrigations.	Area of plots in acre.	Outturn per plot in lbs.		Outturn of gur per acre in lbs.	
		Cane.	Juice.	Gur.	
Irrigated 4 times ...	·01	2,840	1,788	276	2,766
Irrigated 3 times ...	·10	3,262	2,001	353	3,535
Irrigated 2 times ...	·10	2,205	1,351	231	2,312
Irrigated 1 time ...	·10	2,152	1,347	240	2,405

Table showing the results of Irrigation Experiments on Indrasali paddy, Sunti Low, 1921-22.

Irrigated or not.	Area of plots in acre.	Outturn per acre		Average outturn per acre. in lbs.	
		Grain.	Straw.	Grain.	Straw.
Irrigated ...	·33	2,007	4,892	2,007	4,892
Non-irrigated ...	·27	1,554	3,350	...	...
	·33	2,010	4,202	1,782	3,963

APPENDIX E.

Dairy Annual Report from 1920—December to March 1922.

Names of the Cows.	December 1920.	January 1921.	February 1921.	March 1921.	April 1921.	May 1921.	June 1921.	July 1921.	August 1921.	September 1921.	October 1921.	November 1921.	December 1921.	January 1922.	February 1922.	March 1922.	Total.
150 Lily ...	292½	390	316½	376	342¾	345	260¾	175½	110¾	60¼	14¾	...	...	224½	348¾	365¼	3,622½
153 Rosy ...	191¾	275¼	226¼	272	219	149	46¾	...	...	...	...	440	438½	353¾	310¼	343¾	3,266½
155 Nina ...	127¾	181¾	158½	226½	225¾	218¾	161	85	...	...	...	...	...	170¾	339¾	328	2,173½
156 Rani ...	217	262	250	276¾	261¾	240¼	169½	24	...	...	...	...	310½	363	263¾	237	2,884½
159 Dorothy ...	152	177¾	100	148	148¼	145¾	133½	110¼	90¼	54½	2½	...	...	259¼	339	359½	2,220½
160 Cecily ...	156	222	197½	235	166½	1½	...	...	...	...	...	51	5½	...	...	...	1 035
Daisy ...	...	15¼	18	2	...	...	...	...	...	...	...	...	...	...	...	...	35½
Total ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15,238

Allowance for calves and demonstration purpose, etc., 4,431¼ lbs.

APPENDIX F.

Jute seed, 1921.

A.—Quantity of jute seed billed for 1,047¼ mds., received in seed store 1,015 mds.
B.—In addition the further quantity of seed was received from Assam (Government) Planters on 10th April 1921, 61½ mds.

2. Jute seed received :—

		Mds.	Rs.	A.	P.
K. B. Birkmyre Bros. ...	...	643	12,254	9	9
Hay Webb of Muktapur ...	...	6	75	0	0
9 Growers in Bihar ...	...	267½	3,252	10	0
154 D Capsularies 9¾ ditto					
Self sown 3½		96½	327	2	0
R 85 Capsularies 83¼			992	12	0
	Loss ...		33 mds.		

3. Cost of seed Rs. 18 per maund for Birkmyre Brothers.
Ditto „ 12 „ remainder.

	Rs.	A.	P.
4. Birkmyre Brothers' bill	12,254	9	9
670 mds. at Rs. 18 per maund	11,790	0	0

	Rs.	A.
Only 643 mds. received—		
376 mds. other growers at Rs. 12 per maund ...	4,512	0
Total cost	4,647	7

Quantity received 364 maunds.

5. How disposed :—

Dacca—

	Mds.	Srs.
A. O., Faridpur	209½	0
A. O., Kishorganj	70	27
A. O., Mymensingh	31¾	0
A. O., Jamalpur	31½	0
A. O., Dacca	138¾	0
A. O., Barisal	24	0
A. O., Narayanganj	165½	0
Total ...	669¼	0

Chittagong :—

	Mds.
A. O., Noakhali	6
A. O., Chittagong	98¾
Overseer, seed store, local sale	56½
J. Luke, Esq., Narayanganj	98½
Ralli Brothers	5
A. C., Khulna	10¾
S. A., Rajshahi	29½
S. D. O., Manikganj (D)	9¾
Overseer, seed store, local sale	8
Free distribution	25¾
Total ...	1,017¾

In addition to this 61½ maunds were received from growers for Assam Government.
Of this quantity 13 maunds sent to Burmah.
5¼ „ sold locally.
leaving 42¼ maunds in stock.

This quantity 42½ maunds are sealed up for next year. The seed is reported to germinate 78·80 per cent.

A.—There is also stock in hand from 1915 of 37 maunds.
B.—And cleanings from 1920 crop of 15¼ „

1. Chinsurah green jute 1921 :—

This stock was carried over from 1919, 20 maunds 35 seers.
Quantity of seed supplied 1921, 16 maunds 33 seers.
Whole quantity sold. Balance nil.

Jute seed, 1922.

Dacca farm seed store report for the year 1921-22.

	Mds.	srs.	chs.
Supply of seeds during the year—			
1. Jute seeds—Capsularies	783	36	8
Olitorius	54	32	11
	838	29	3
2. *Aus* paddy—Kataktara	121	25	8
3. Sugarcane cuttings	41,150	0	0
	Rs.	A.	P.
Sale proceeds—			
Amount credited to the Treasury	5,765	0	9
Receipts by book transfer	1,725	0	3
Bills outstanding	11,465	15	0
	18,956	0	0
Expenditure—			
Establishment	531	3	8
Labour supplied from Dacca farm	222	11	6
Contingencies	2,077	3	3
Cost of seeds	14,647	7	0

APPENDIX XIII.

ANNUAL REPORT OF THE TIPPERA DISTRICT FARM FOR 1921-22.

The farm is situated one mile west of Comilla town near the railway station. The Grand Trunk Road from Dacca to Comilla forms the boundary on the northern side.

Actual cultivation on the farm commenced in April 1920.

Except for a small area in the north-east corner, there was no high land in the farm which is thus only suitable for paddy cultivation. This has been remedied to a certain extent during the past winter by the raising of more high land.

The farm has been laid out into $\frac{1}{10}$th acre plots and the levelling of fields and raising or roads has reduced the fertility of the soil which will have to be restored by heavy manuring. It will therefore be difficult to arrange for reliable variety tests for a year or so.

The farm drainage has been improved.

Area.

The area of the farm is 20 acres, of this 2·5 acres are occupied by quarters, office and godown, cattle shed, coolie sheds and pasture which is about $\frac{3}{4}$rd of an acre, 2 acres are occupied by drains and roads, 1 acre by 3 tanks, 1·5 acres are high land and 13 acres are low lands under cultivation.

General aspect.

The farm is divided into four rectangular blocks. Each block with one exception is subdivided into $\frac{1}{10}$th acre plots. There is a central tank covering an area of 1 bigha 14 kathas and two small tanks one in the north-east corner and another in the south-west corner with areas of 15½ kathas and 10½ kathas, respectively.

Land.

The total high land under cultivation was previously about $\frac{3}{4}$rd acre only. This being considered insufficient for growing sugarcane and other *rabi* crops about $\frac{3}{4}$rd acre in block (II) has been sufficiently raised by the earth from the new tank in south-west corner excavated within the year under report. The total high land suitable for *rabi* crops and sugarcane is now 1·5 acres. During the year under report a portion of one block (IV) has been deepened by 1′ for deep water paddy experiments.

Soil.

The agricultural chemist proposes shortly to analyse the soil and sub-soil of this farm. It is typical of the paddy land of Tippera district.

Season.

The season of 1921 was a very wet one as will be seen from the following table :—

1921.		No. of rainy days.	Normal rainfall.
January	0·61″	3 days	0·45″
February	·16″	1 day	1·03″
March	19·24″	5 days	2·82″
April	2·82″	4 ,,	5·95″
May	12·78″	12 ,,	12·00″
June	36·47″	17 ,,	18·05″
July	19·75″	18 ,,	15·65″
August	16·65″	16 ,,	16·67″
September	14·16″	15 ,,	10·59″
October	8·28″	10 ,,	5·80″
November	Nil	...	1·02″
December	Nil		0·36″
	130·92″		90·33″
1922.			
January	Nil		
February	Nil		
March	0·15 on 1 day.		

There was thus an excess of 40″ above the normal. The heavy rainfall of March permitted the early preparation of the land but the heavy rainfall of June was fatal for that part of the jute crop that was sown late.

The season was fair for jute and *aus* paddy, favourable for *amon* paddy and bad for all *rabi* crops.

Crop on this farm in 1921.			Total outturn.	Yield per bigha.
			Mds. srs.	Mds. srs.
Aus paddy	...	... 17 bighas.	48 14	2 33½
Aman ,,	...	... 35 ,,	213 7	6 3
Sugarcane	...	... 13 kattahs.	10 0 gur.	15½ 0
			6,000 cuttings.	
Aus paddy	...	6½ bighas Kataktara }	All followed by aman	
		½ ,, Suchial }	paddy.	
Suchial	...	½ ,, yield 1 md. 5 seers.		
		Yield per bigha 2 mds. 10 seers.		

Aus paddy.—Sown 18th of April up to middle of May. Harvesting 27th of July up to middle of August.

If we wish to grow an *aus* paddy before the *Indrasail* the *aus* paddy must be off the land very early. It is obvious that *Kataktara* will not suit such conditions, so an earlier ripening variety must be sought for. The result of the year's work was a supply of 40 maunds of *Kataktara*, 200 maunds of *Indrasail* and some Tanna cane for distribution in the district.

Aman paddy.—Transplanted from 9th of July to 15th of October. Harvesting 7th of December up to 28th of December.

The crop that was transplated eary in July and was harvested in the beginning of December, yeilded at the rate of 7¼ maunds per bigha, but the crop that was transplanted in September and October only yielded at the rate of 4½ maunds per bigha. *Indrasail* paddy is a long season paddy and any attempt to use it in any other way will end in unsatisfactory results. Seven and a half maunds per bigha is a fair return.

Chaplaish *aman* paddy, the best local variety, was not fairly compared with *Indrasail* last year.

Maize failed on the land after *aman* paddy. Irrigation was given.

Juar did well on the high land.

Fodder crops.—An area of 8 kattahs was sown with *maize* and *cowpea*, and *juar* and *cowpea*. They grew well and supplied sufficient green fodder to the 6 bullocks for 2 months. Guinea grass is being tried on a small scale.

Sugarcane.—Tanna cane was tried on 13 kattahs of land. About half of the land at the eastern and western ends of the plot is bad land. The whole plot gave an outturn of 10 maunds of *gur*. besides 7,500 cuttings, 4,000 of which were distributed for demonstration in the district and 3,500 were kept for the farm. This variety was appreciated by the cultivators who generally grow the *kheri* cane variety for *gur*. It grew very well, standing erect, and also resisting borer to a great extent. The only defect from the cultivators standpoint is that *Tanna* requires more manure and better cultivation.

Vegetable garden.

The vegetable garden area is 5 kattahs. Cabbages, cauliflowers, peas, potatoes, beans, and tomatoes were grown. Potatoes were obtained from Darjeeling. The outturn was poor. Tomato seeds were obtained from Messrs. Sutton & Sons, other seeds were obtained from the Government Gardens, Shahranpur. Peas and cabbage did well. A good number of vegetable seedlings were raised and sold to the public.

Pisciculture.

The central tank.—This is being stocked with *Rohi*, *Katul* and 300 fry were put in. Cocoanuts have been planted on the four banks of the tank.

Cattle.

This farm possesses 6 bullocks.

Visits and management.

During the year under report the farm was visited by the Hon'ble Minister of Agriculture in August, by the Director of Agriculture and by the Collector Mr. Wares. Babu B. C. Ghose was in charge up to June when Babu B. L. Mukherjee took over charge. The Superintendent of Agriculture, Chittagong Division, and myself inspected the work frequently.

Farm Receipts and Expenditure.

Receipts during the year were Rs. 572-10-6 while farm produce in hand on 31st March 1922 was Rs. 803 and stock in hand on 31st March 1922 was valued at Rs. 1,731-7 (Appendix A). There was one outstanding bill of Rs. 40-8 for sugarcane cuttings. Expenditure was Rs. 4,098-9.

APPENDIX A.

Stock-taking.

Stock in hand on 31st March 1922 was valued as follows :—

		Rs.	A.
Furniture	...	291	7
Implements	...	609	8
Cowdung	...	40	0
Straw	...	150	0
Miscellaneous	...	245	8
Cattle	...	400	0
Total	...	1,731	7

Financial statement of Comilla Farm for 1921-22.

RECEIPTS.

	Rs.	Rs	A.	Rs.	A.	P.
Total amount credited into Treasury being the sale-proceeds of paddy, vegetables, vegetable seedlings, *gur*, etc. ...		...		572	10	6
Value of stock in hand as per stock list ...		...		2,534	15	0
Implements ...	...	604	8			
Seeds and farm produce	...	803	8			
Manure (cow dung)	...	40	0			
Miscellaneous including straw ...	150	795	8			
Fish	30					
Live stock ...	400					
Bill outstanding of this of Rs 40 is against the District Agricultural Officer, Tippera, for 4,000 sugarcane cutting supplied for demonstration ...		...		40	8	0
Total		...		3,148	1	6

EXPENDITURE.

	Rs.	A.	P.
Feed of cattle	507	2	½
Seeds, manures and implements	511	14	0
Labour for cultivation ...	843	6	4
Reclamation and laying out ...	709	10	6
Petty construction and repairs	959	10	2½
Miscellaneous including railway freight, taxes, stamps, etc. ...	566	13	11
Total ...	4,098	9	0

F. SMITH,

Deputy Director of Agriculture Eastern Circle.

APPENDIX XIV.

ANNUAL REPORT OF THE DISTRICT FARM, MYMENSINGH, FOR THE YEAR 1921-22.

Introductory.

The Mymensingh Farm is situated near the bank of the old Brahmaputra river and 3 miles south of Mymensingh town, between the Mymensingh-Dacca Road and Eastern Bengal Railway line to Dacca.

The area of the farm is 20 acres, of which 12·5 acres are under cultivation, the remainder being occupied by roads, buildings, farmyard, etc. The farm has been laid out for demonstration and experimental work, and was established in the beginning of 1920.

Soil.

The soil is a sandy loam on a sandy subsoil. The soil is light, friable and easily workable and is rich in lime, potash and phosphoric acid but is poor in organic matter.

I am indebted to the Agricultural Chemist, for the following analysis of a sample of soil and subsoil from the high land of the farm. His figures corroborate what I have recorded above and agrees with all the field observations hitherto made :—

(Average sample Plots 45, 9 and 10). Mymensingh Farm (sugarcane plots 1921) High Land.

	Sugarcane soil.	Sub-soil.
Moisture	1·02	·94
Organic matter, etc.	2·78	2·66
Insol, silicate	81·11	79·72
Potash (total)	1·02	1·20
Lime (Ca O)	1·22	1·20
P_2O_5	·153	·144
Nitrogen (total)	·05	·04

Three other samples have been taken of paddy and jute lands but not yet analysed.

Season.

The season was favourable for jute, *aus* paddy, *aman* paddy and sugarcane but unfavourable for all *rabi* crops.

The following table gives the rainfall during the year :—

	Normal.	1921-22.	No. of rainy days.
	Inches		
January	0·39	·61	1
February	1·00	Nil	Nil.
March	2·11	5·52	9
April	5·17	7·53	8
May	12·59	12·91	10
June	19·06	10·78	16
July	16·16	15·46	20
August	15·36	9·68	22
September	14·11	13·09	9
October	5·33	6·76	9
November	0·69	Nil	Nil.
December	·11	Nil	Nil.
Total ...	92·08	82·34	
		1922.	
January	0·39	Nil	Nil.
February	1 00	Nil	Nil.
March	2·11	Nil	Nii.

Crop outturns of Mymensingh Farm in 1921.

Crop and work.

The following crops were grown and outturns obtained :—

Name of crops.	Total area.	Total outturn.	Outturn per bigha.	Outturn per acre.
	B. k.	Mds. srs.	Mds.	Mds.
Indrasail	19 1	60 28	3	9
Dudsar paddy	5 2	17 7	3½	10½
Kataktara paddy	18 4	95 5	5¾	5¾
K. B. Jute fibre	2 18	8 2	...	...

There was no rain after the 11th October 1921 and as a result the season was very unfavourable for all *rabi* crops.

The yields of the crops of 1921 of the farm were disappointing.

Eighteen bighas of *Kataktara* were followed by *aman* paddy on the same land. *Kataktara* yielded 5½ maunds per bigha but *Indrasail* only yielded 3 maunds per bigha A detailed examination reveals the fact that *Kataktara aus* paddy was broad-casted on 25th April 1922 and harvested in the last week of August while *Indrasail aman* paddy was sown in the first week of September and harvested in the first week of December. The low outturns of *aman* paddy can be partly explained by the short growing season. It takes a fortnight for transplanted seedlings to take a solid hold of the ground. This means that there was only a month of plentiful water-supply for growth as the last heavy downpour took place on 7th October 1922 when 3·60″ fell. I think it will be found that in a normal year a variety of *aus* that is ready for harvesting in the beginning of July and an earlier ripening *aman* paddy than the one we have at present will be found the most suitable for this farm with its light soils.

This Department, of course, has never recommended either *Kataktara* or *Indrasail* as varieties for double cropped land. They are both long season varieties.

Details follow.—Kataktara was broadcasted on 15th April 1921 and harvested on 24th August 1921. *Indrasail* was transplanted on 31st August 1921 and harvested on 4th December.

Plot No.—

B 1. ⅛th acre *Kataktara* yielded 3 maunds 7 seers or 15 maunds 35 seers per acre.

B 1. *Dudsar* yielded 1 maund 18 seers or 7 maunds 10 seers per acre.

B 3. ⅛th transplanted 31st August 1921, 6th February 1921—
Kataktara yielded 2 maunds 1 seer or 10 maunds 5 seers per acre.
Harvested 24th July 1921.

B 4. $\frac{1}{10}$th acre *Kataktara* yielded 1 maund 11 seers or 12 maunds 30 seers per acre—
Broadcasted 25th April 1921.
Harvested 24th August 1921.

B 4. *Dudsar* transplanted 2nd September 1921 yielded 1 maund, 4th December 1921.

B 5. ⅛th acre *Kataktara*—
Broadcasted—25th April 1921.
Harvested—25th August 1921.

Manure—
Mustard cake yield 2 maunds 7 seers per plot or 10 maunds 35 seers per acre.

Indrasail transplanted 9th September 1921 yielded 1 maund 20 seers or 7 maunds 20 seers per acre. Harvested 6th December 1921.

B 6. 10 kattahs *Kataktara*, ⅛th acre sowing 2nd May 1921—
Harvesting 30th August 1921.
Yielded 2 maunds 2 seers per plot or 12 maunds 12 seers per acre.

B 6. *Indrasail* transplanted 9th September 1921. Harvested 6th December 1921.
Yielded 1 maund 4 seers per plot or 6 maunds 24 seers per acre.

The outturn of other crops was very poor.

I collaborated with 1st Economic Botanist in work on pulses, the 2nd Economic Botanist on cotton, the Fibre Expert on jute and the Agricultural Chemist on tobaccoes. These officers published the results obtained.

Farm receipts and expenditure.

A sum of Rs. 539-11-3 for sale-proceeds was credited to the treasury, while Rs. 282-15-3 for outstanding bills are considered good. Stock worth about Rs. 2,444-10 was in hand on the 31st March 1922.

The expenditure incurred amounted to Rs. 5,671-9-7 which included petty repairs.

Management.

Babu P. K. Das in charge throughout the year. He is a willing worker but lacks experience on the practical side. He had to do District demonstration work in the Sadar as well as in the Netrakona subdivisions and also the jute forecast in both these subdivisions which entailed heavy work. Much of his time also was taken up in straightening up the accounts for paddy seed distributed in this Circle left by his predecessor.

Mela.

Babu P. K. Das is further to be congratulated on the successful *mela* held on this farm in January 1922.

I cannot do better than say it was the cheapest run show we have ever had in the Province. It cost us Rs. 250 and local people Rs. 150 while Rs. 200 were distributed in prizes. There were a good lot of exhibits and a crowd of visitors. Light refreshment were offered and the day ended with a bioscope entertainment.

The Director of Agriculture, Bengal, visited the farm several times—all the Experts inspected their plots. Superintendent of Agriculture and myself inspected the work frequently.

F. SMITH,

Deputy Director of Agriculture, Eastern Circle.

APPENDIX XV.

REPORT OF THE BARISAL DISTRICT FARM FOR THE YEAR ENDING 31ST MARCH 1922.

Twenty acres of land were acquired for the farm in 1920. The land is situated two miles south of Barisal town and is typical of the transplanted paddy fields of this district. It is inundated by high tidal water in the rainy season and a fair deposit of silt is obtained every year.

The area is 60 bighas and 10 kattahs and about 47 bighas of land are available for cultivation. Of these about 41 bighas are low paddy lands, 2½ bighas high land and 3½ bighas medium land. The remaining 13 bighas 10 kattahs are occupied by a tank, office, quarters, roads, etc. The tank commands the whole farm and irrigation experiments can be conducted, if necessary, without much difficulty. There is a big khal running north and east of the farm which could also be utilised for irrigation when necessary for this purpose.

The District Agricultural Office and Seed Store were removed to this farm early in July 1921 when farm work began. No extra staff was obtained for the farm. The Sadar Demonstrator helped in the work both in the office and farm.

The cultivation of paddy was taken up immediately. The land had been fallow for two years before we began work.

There were no farm bullocks so the work was done by hired cattle and seedlings were sown on the farm in July. Six bullocks were purchased in December.

Soil.

The Agricultural Chemist has kindly supplied the following analyses of the soil and sub-soil of this farm:—

	Soil.	Sub-soil.
Water	2·25 per cent.	1·9 per cent.
Loss on Ignition ...	6·15 „	2·258 „
Silica	65·00 „	71·00 „
K_2O	2·63 „	2·25 „
P_2O_5	·128 „	·14 „

Mr. Carbery says—"These samples contain very high Potash (K_2O) contents plenty of lime (CaO) and sufficient phosphate. The nitrogen contents will be completed later."

Season.

The following table gives the rainfall and number of rainy days in 1921 as compared with the normal :—

	Amount.	Number of rainy days.	Normal.
1921			
January	0·67″	3	0·48″
February	0·24″	1	1·10″
March	6·68″	4	2·42″
April	2·17″	3	3·95″
May	5·18″	6	8·66″
June	14·03″	17	16·59″
July	19·48	20	15·95″
August	14·32″	25	13·23″
September	5·99	12	11·16″
October	4·59	6	5·64″
November	Nil	Nil	1·35″
December	Nil	Nil	0·34″
	73·55″	97	80·87″
1922			
January	Nil	1	
February	0·02″		
March	Nil	Nil	

The season was very favourable for *aus*, jute and *aman* paddy but unfavourable for all *rabi* crops.

Crops.

The farm is suited to *aman* paddy and *Indrasail* was compared with local Backerganj varieties :—

Aman paddy.	Total outturn.	Yield per bigha.
	Mds.	Mds.
Indrasail 13 bighas	91½	7
Khiraijali 22 „	181	7¾
Chaplaish 5 „	41½	8⅓

3 bighas = 1 acre, 82 lbs = 1 maund.

Khiraijali and *Chaplaish* both local varieties of the *balam* type of paddy proved superior yielders. This work will be continued but as Backerganj is a famous rice-growing tract we propose to select out the best of the local *balam* varieties and test the selections. After *aman* paddy pulses were sown and gave the following results :—

	Total Outturn.	Yield per bigha.
	Mds.	Mds.
Khesari 11 bighas	23	2
3 „	Cut green and not weighed.	
Lentils (Musur) 4 bighas ...	1	¼
Gram 14 bighas	...	...

The local practice is to sow *khesari* and *musur* broadcast on the still wet land at paddy harvest. This practice was tried and also with gram. The results were not very promising but the green fodder which unfortunately was not estimated or weighed is a very valuable addition in these days of fodder scarcity.

We also tried peas vegetables and potatoes with irrigation but further experience is required before we can come to definite conclusions.

Three pairs of bullocks were purchased for the farm in December 1921.

Farm Receipts and Expenditure.

Receipts were Rs. 970-13-6 for sale-proceeds. There are no outstandings and there was stock in hand, on 31st March 1922 of Rs. 1,645-3 apart from land and building while expenditure including Rs. 659 for bullocks was Rs. 5,513-12-3. (See Appendix A for details).

Management.

Babu S. N. Sen was in charge. He worked labriously throughout the year. The Director of Agriculture, the Superintendent of Agriculture, Dacca Division, and myself inspected the work frequently.

F. SMITH,

Deputy Director of Agriculture, Eastern Circle.

APPENDIX A.

Receipt and Expenditure of the Farm.

RECEIPTS.

	Rs. A. P.	Rs. A. P.
Sale-proceeds credited to Treasury	...	970 13 6
Paddy	775 0 0	
Pulses	72 5 9	
Vegetables	96 13 0	
Potatoes	20 2 0	
Sugarcane	6 8 0	
	970 13 6	
Stock in hand ...	...	1,645 3 0
Paddy seed 4 maunds 5 seers at Rs. 2-8 per maund	10 5 0	
One maund fine balam paddy seed at Rs. 3-8	3 8 0	
(*b*) Pulses—		
Khesari 5 maunds at Rs. 3-6 per maund	16 14 0	
Musuri 1 maund at Rs. 4-8 ...	4 8 0	
	35 3 0	
Paddy straw ...	250 0 0	
Bullocks	600 0 0	
Implements ...	760 0 0	
	1,645 3 0	

EXPENDITURE.

	Rs A. P.
Purchase and feed of cattle	727 15 3
Wages of labourers ...	1,068 1 0
Seeds, manures and implements	1,167 6 9
Furniture	170 0 0
Reclamation	82 3 0
Office expenses and miscellaneous	198 2 3
	3,513 12 3

APPENDIX XVI.

REPORT OF THE GOVERNMENT CATTLE FARM, RANGPUR, FOR THE YEAR 1921-22.

Site and description.

The farm is situated on the eastern border of the Rangpur Town and is very close to the Rangpur railway station.

The area is 333·4 acres (1,000 bighas) consisting of 250 acres of high lands meant for growing fodder crops and for pasture and 83 acres of low lands for paddy cultivation.

Soil.

The soil of the farm is sandy loam and is very suitable for growing fodder crops such as joar, maize cowpea, etc. Some patches of lands seem to be barren but if manured highly with cowdung they produce excellent fodder crops.

Laying out of plots and reclamation.

All the pasture lands were originally laid out close to the cattle yard, *i.e.*, in the office block and the fodder crops were formerly cultivated on land remote from the cattle sheds. Consequently much cartage was involved and much loss of time and labour owing to the long lead. This has been completely changed in the year under report and the crops are now grown in the old grazing area nearer to the farm stead under the direct orders of the Director of Agriculture. The result has been a marvellous economy of labour which can be attested to by comparing the cost of labour for the year 1920-21 with that of the year under report. This economy is also attributed to strict supervision and more careful management. The health of the bullocks has also been improved to a great extent as the result of this action.

Petty construction and repairs.

The District Board building which was built on this farm as quarters for the itinerant Veterinary Assistant, has been purchased in the year under report and the building will be utilised for the farm staff. Eighteen cooly huts have been erected accommodating most of the coolies who had before been suffering for want of sheds.

Cattle breeding experiments.

The cattle breeding experiments laid down originally have been conducted since the year 1919 and have been attended with remarkable progress. Great improvement has been obtained in the cross-bred stock got by the Hissar bull. Most of the offsprings are very promising, the Hissar blood being dominant and very much in evidence. The first result of these experiments is that the matured and well developed half bred bull calves have been sent out to the Government Farm for stud purposes. It is hoped that this will cause an improvement in the local stock. The half bred Hissar heifers appeared to have achieved a high mark of efficiency and are likely to prove high yielding milch cows. Ten such heifers have been covered by the Hissar bulls recently purchased. In the country herd too a decided improvement is noticeable in the offspring. The milk yield of those heifers which have calved this year excels that of their dams as is shown in the table below and the result is probably due to better attention and feeding since birth.

TABLE I.

Comparative statement showing the milk yield of dam and her offspring.

Name of the dam and her offspring.	Stock No.	Total yield.	Maximum of milk in one day.	Minimum of milk in one day.	Average.	Remarks.
		lbs.	lbs.	lbs.	lbs.	
Chhotki dam ...	24	797½	7½	½	4·22	
Chhaya daughter ...	249	1,964½	10	2½	6·62	
Mungri	39	940¾	5¼	1	3·2	
Munri	214	1,708	10	2	5·95	
Sukumari ...	17	513½	13	9	10·07	(in 51 days) still in milk.
Surachi	242	664	15	12½	13	(in 51 days) still in milk.
Budhni	16	790	7½	1	3·2	
Gouri	105	964	10	1	4·5	(gave birth prematurely).
Sunni	47	605	4½	¼	2·6	
Prova	115	1753½	11	3	6 51	

Distribution of bulls.

Seven selected country bulls have been distributed to the following District Boards and public bodies :—

(1)	Midnapur District Board	2 bulls.
(2)	Noakhali District Board	3 „
(3)	Local Board, Tejpur	1 bull
(4)	Khulna District Board	1 „

Eight selected half bred Hissar bulls have been sent to the following Government Agricultural Farms :—

(1)	Government Demonstration Farm, Rangpur	1
(2)	Government Tobacco Farm, Burirhat	2
(3)	Rajshahi Farm	2
(4)	Pabna Farm	1
(5)	Bogra Farm	1
(6)	Chinsurah Farm	1

Milk yield of the herd.

The average yield of the herd of the farm has been considerably increased as shown in the table below. This is alone due to good feeding, care and management and it may be said that if the Bengali cultivators wish to increase the milk yield of their cows they should adopt the method practised in the farm.

TABLE No. II.

Statement of daily milk yield of the whole herd, 1920-21 and 1921-22.

Months.	1920-21. Average yield in lbs. daily.	1921-22. Average yield in lbs. daily.
April	2·56	5·64
May	2·34	6·88
June	2·38	6·39
July	2·74	6·21
August	2·94	6·35
September	2·74	6·97
October	2·94	6·65
November	2·60	6·01
December	2·80	7·30
January	4·80	8·26
February	4·4	8·85
March	5·3	9·49

The milk yield of some individual cows with the lactation period is set forth in the table below :—

TABLE No. III.

Name.	Stock No.	No. of days in lactation.	Total yield.	Average yield per day.	Maximum in 1 day.	Minimum in 1 day.	Remarks.
			lbs.	lbs.	lbs.	lbs.	
Pramila ...	79	125	2,095½	16·76	18½	13·5	Still in milk.
Niroo ...	94	341	3,792	11·12	14	2 5	
Menoka ...	6	47	759	15·13	19·5	12	
Sitala ...	61	122	1,132½	9·3	14½	3·0	Still in milk.
Sundary ...	108	103	949	9·21	11½	9·0	Do.
Champa ...	104	130	1,283½	9·87	12	8 5	Do.
Sree ...	13	100	1,147	11·47	13	7·5	Do.
Ilshi ...	38	95	1,356½	14·27	16	10·5	Do.
Kushi ...	11	93	1,097	11·8	15	4·0	Dead.
Sachi ...	8	86	748½	8·7	11	6·5	Still in milk.
Juthi ...	9	48	673	14·02	16 5	8·5	

Weaning process.

This process is being tried on cows calving for the first time as well as on those cows calving for the second or the third time, and is being successfully practised.

Six calves have been completely weaned and four have been partially weaned. The weaned calves are in excellent conditions. The milk yield of these cows is detailed in the table below :—

TABLE IV.

Name.	Stock number.	Total yield.	Number of days milked.	Weaning process.	Remarks.
		lbs.			
Chaya	249	1964½	296	Completely weaned.	
Surachi	242	664	51	Do. ...	Up to 31st March 1922.
Aeru	259	44	13	Do. ...	
Ila	250	1,377	195	Do. ...	Up to 31st March 1922.
Timly	207	263	102	Do. ...	Dry.
Moonry	214	1,708	287	Do. ...	Up to 31st March 1922.
Sundari	108	949	105	Partially ...	Premature birth still giving milk.
Jhoonoo	106	894½	110	Do. ...	Calf died, still, giving milk.
Chotki	24	591	86	Do. ...	Gave birth to a dead calf.
Gouri	105	172	16	Do. ...	

Strength of the herd.

1. Cows ...	Class I			24
	Class II			31
2. Young Stock (1 year and above).	Male	Half-bred Hissar ...		9
		Country ...		10
	Female	Half-bred Hissar ...		29
		Country ...		14
3. Young stock (below 1 year).	Male	Half-bred Hissar ...		6
		Country ...		11
	Female	Half-bred ...		7
		Country ...		10
4. Bulls	... ...	Hissar ...		2
		Country ...		4
5. Bullocks	... ...			39
6. Young bullocks	... ...			30
		Total ...		226

Disease and Casualties.

In the month of May 1921 foot and mouth diseases broke out in the herd. Prompt measures viz., the segregation of the herd, disinfection of the sheds, careful nursing of the animals, etc., having been taken the outbreak was brought under control only to single death occurring but the disease told much upon the health of the cattle affected. Contagious abortion in seven cases appeared in the herd with virulence but its spread was checked in time by the adoption of the following preventive measures:—

(*a*) Burial of burying of aborted calf and after birth.
(*b*) Thorough disinfection of the stall, drain, etc.
(*c*) Segregation of the affected animals.
(*d*) Precautions with the attendance of the affected.
(*e*) Flushing out vagina of all affected cows with weak solution per cow every third day for one month being used. These cows were not allowed to be served within four months from the date of such abortion and in each case the bull was thoroughly cleansed with a similar solution over the region of sheath and abdomen—before and after each service. The cows were also treated in a similar way before service.
(*f*) None of the aborted cows were allowed to graze for 14 days after abortion and then only by themselves for about 2 months after such date.

The Superintendent's, Civil Veterinary Department, advice was requested and his suggestions were strictly adhered to.

TABLE No. 4.

List of casualties of animals.

Serial No.	Class of animals.	Cause of death.
1	1 Cow	... Echniococosis and old age.
2	2 Heifers	... 1 accident. 1 rapture of spinal chord.
3	9 Sucklings	... Premature birth, dysentery, fever and cough, navel ill, etc.
4	1 Young bull	... Pneumonia.
5	2 Bullocks	... Debility, old age and echniococosis

General health of the animal.

The general health of the animal remained quite satisfactory during the year under report and also improved to a great extent.

Selection and Elimination Board.

A board was held in October 1921 on the farm under the guidance of Mr. Evans, the Director of Agriculture, Bengal, Mr. J. N. Sarkar, the Officiating Deputy Director of Agriculture, Northern Circle, and Mr. A D. MacGregor, Superintendent, Civil Veterinary Department, and the following cattle were rejected.

Class of animals.	No. of rejected cattle.	Points for elimination.
Half bred Hissar bull calf	... 7	Devoid of good points for stud purposes.
Country bull calves ...	... 15	
Cows	... 8	Old age.

Climatic conditions.

The following table will show the rainfall statistics of the locality. Monthly rainfall register of the Rangpur District :—

The rainfall during the year under report was as follows :—

Month.	Actual rainfall.		Normal rainfall.	
	Amount of rainfall.	Number of rainy days.	Amount of rainfall.	Number of of days.
1921.				
April	2·47	7	3·01	4·3
May	7·08	13	16·66	11·5
June	13·51	14	18·00	15·7
July	32·01	19	15·89	15·0
August	4·73	11	12·80	15·7
September	17·05	15	14·24	13·3
October	8·66	6	4·87	4·4
November	Nil	Nil	0·12	0·2
December	Nil	Nil	0·05	0·2
1922.				
January	1·19	3	0·50	0·9
February	Nil	Nil	0·50	1·2
March	3·75	3	1·25	1·8
Total ...	90·45	91	81·93	92·2

The climatic conditions were very satisfactory in the beginning of the year under report but in the *rabi* season there was practically no rain and consequently the *rabi* crops were somewhat unsatisfactory. As there were no showers in February and March 1922 the early fodder crops could not be successfully grown.

Fodder crops.

Maize, joar and cowpea in the *kharip*, and oats and peas in the *rabi* season were grown for fodder purposes. The fodder crop gave very satisfactory results, specially the maize crop; but owing to servere drought during the *rabi* season the late sown oats and peas gave a poor outturn. During the *rabi* season *masyam* were also tried in the low-lying fields after the harvest of the paddy crop, but as the seed was obtained late the germination of the crop was not successful. It is expected that if it be sown in time it will be an excellent fodder crop.

The following outturn of fodder as in this farm is tabulated below :—

Plot No.	Area.	Total outturn.	Outturn per acre.
	Maize.		
	B. k.	Mds. Srs.	Mds. Srs. Chs.
20	24 0	1,760 0	251 18 0
26	34 15	2,719 30	236 20 0
27	31 4	3,648 0	347 0 14
48	13 7	640 0	160 0 0
57	4 0	320 0	240 0 0
	Joar.		
53	15 12	1,860 0	357 27 11
54	11 5	968 0	258 5 5
57	4 0	688 0	516 0 0
58	28 0	1,296 0	138 34 0
	Joar and cowpea.		
16	23 0	1,670 0	217 33 0
	Oats and peas.		
		Mds. Srs.	
20	35 12 ...	99 38 oats 28 5 peas	
16	5 0 ...	92 37 oats 3 12 peas	
26	34 15 ...	70 5 oats 6 37 peas	
27	31 4 ...	123 39 oats 9 9 peas	
54 & 57	19 0 ...	24 36 oats 4 38 peas	

Two varietal experiments with fodder crop were conducted during the khariff season.

1. Local maize *vs.* Kalimpong varieties.
2. Local joar *vs.* New fodder varieties.

Results of experiments on local maize *vs.* Kalimpong varities.

Serial No.	Name of variety.	Area.	Date of sowing.	Date of harvesting.	Yield per acre.
		Acre.	1921.	1921.	Mds. Srs.
1	Local ...	$\frac{1}{20}$th	19th April ...	1st July ...	255 0
2	Yellow round ...	Do.	19th ,, ...	1st ,, ...	370 0
3	White round ...	Do.	19th ,, ...	1st ,, ...	260 0
4	Local ...	Do.	19th ,, ...	1st ,, ...	225 0
5	Yellow round ...	Do.	19th ,, ...	1st ,, ...	280 0
6	White round ...	Do.	19th ,, ...	1st ,, ...	281 20
7	Local ...	Do.	19th ,, ...	1st ,, ...	175 0*
8	Yellow round ...	Do.	19th ,, ...	1st ,, ...	310 0
9	White round ...	Do.	19th ,, ...	1st ,, ...	300 0
10	Local ...	Do.	19th ,, ...	1st ,, ...	300 0
11	Yellow round ...	Do.	19th ,, ...	1st ,, ...	290 0
12	Local ...	Do.	19th ,, ...	1st ,, ...	240 0
13	White round ...	Do.	19th ,, ...	1st ,, ...	240 0
14	Yellow round ...	Do.	19th ,, ...	1st ,, ...	200 0
15	Local ...	Do.	19th ,, ...	1st ,, ...	200 0

* Due to water logging.

Serial No.	Name of variety.	Area.	Date of sowing.	Date of harvesting.	Yield per acre.
		Area.	1921.	1921.	Mds. srs.
16	White round ...	$\frac{1}{20}$th	19th April ...	1st July ...	190 0*
17	Yellow round ...	Do.	19th „ ...	1st „ ...	210 0
18	Local ...	Do.	19th „ ...	1st „ ...	160 0*
19	White round ...	Do.	19th „ ...	1st „ ...	190 0*
20	Yellow round ...	Do.	19th „ ...	1st „ ...	195 0*

* Due to water logging.

Average outturn per acre—

	Mds.	srs.	chs.
Local	222	6	0
White round	243	22	8
Yellow round	265	0	0

From the table it will be seen the Kalimpong maize yellow round variety beat local variety by 42 maunds 34 seers and the white round beat the local by 21 maunds 16 seers green fodder per acre.

Results of new fodder varieties.

Serial No.	Name of variety.	Area.	Date of sowing.	Date of harvesting.	Yield per acre.
		Acre.	1921.	1922.	Mds.
1	Hundi ...	$\frac{1}{20}$th	27th April ...	8th April ...	230
2	Local ...	Do.	27th „ ...	8th „ ...	210
3	Lyalpur ...	Do.	27th „ ...	8th „ ...	200
4	Nilwa ...	Do.	27th „ ...	8th „ ...	190
5	Local ...	Do.	27th „ ...	8th „ ...	210
6	Kalbandi ...	Do.	27th „ ...	8th „ ...	210
7	Sabour ...	Do.	27th „ ...	8th „ ...	390
8	Sargoum ...	Do.	27th „ ...	8th „ ...	200
9	Sundhia ...	Do.	27th „ ...	8th „ ...	200
10	Local ...	Do.	27th „ ...	8th „ ...	300
11	Sundhia ...	Do.	27th „ ...	8th „ ...	265
12	Local ...	Do.	27th „ ...	8th „ ...	235
13	Sabour ...	Do.	27th „ ...	8th „ ...	350
14	Sargoum ...	Do.	27th „ ...	8th „ ...	230
15	Local ...	Do.	27th „ ...	8th „ ...	300
16	Kalbandi ...	Do.	27th „ ...	8th „ ...	240
17	Lyalpur ...	Do.	27th „ ...	8th „ ...	220
18	Nilwa ...	Do.	27th „ ...	8th „ ...	270
19	Hundi ...	Do.	27th „ ...	8th „ ...	210
20	Local ...	Do.	27th „ ...	8th „ ...	260

Among the varieties tried Sabour, Sundhia and local were found to be quite satisfactory. Sabour variety topped the list.

Two comparative experiments on *rabi* fodder crops were conducted in the year under report.

1. Oats *vs.* Wheat.
2. Oats *vs.* Barley (as the plot was sown late and the climatic condition was very unfavourable owing to long continuous drought, the crop failed).

The results of experiments on wheat *vs.* oats in the Rangpur Cattle Farm.

Serial No.	Crop.	Days of sowing.	Date of harvesting.	Area of of sub-plot.	Outturn of green fodder per acre.
		1921.	1922.	Acre.	Mds.
1	Oats ...	11th December ...	8th March ...	$\frac{1}{20}$th	70
2	Wheat ...	11th „ ...	9th „ ...	Do.	55
3	Oats ...	11th „ ...	8th „ ...	Do.	60
4	Wheat ...	11th „ ...	9th „ ...	Do.	40
5	Oats ...	11th „ ...	8th „ ...	Do.	60
6	Wheat ...	11th „ ...	9th „ ...	Do.	45
7	Oats ...	11th „ ...	8th „ ...	Do.	80
8	Wheat ...	11th „ ...	9th „ ...	Do.	70
9	Oats ...	11th „ ...	8th „ ...	Do.	80
10	Wheat ...	11th „ ...	9th „ ...	Do.	50
11	Oats ...	11th „ ...	8th „ ...	Do.	60
12	Wheat ...	11th „ ...	9th „ ...	Do.	45
13	Oats ...	11th „ ...	8th „ ...	Do.	90
14	Wheat ...	11th „ ...	9th „ ...	Do.	155
15	Oats ...	11th „ ...	8th „ ...	Do.	100
16	Wheat ...	11th „ ...	9th „ ...	Do.	175
17	Oats ...	11th „ ...	8th „ ...	Do.	130
18	Wheat ...	11th „ ...	9th „ ...	Do.	100
19	Oats ...	11th „ ...	8th „ ...	Do.	180
20	Wheat ...	11th „ ...	9th „ ...	Do.	160

From the above table it will be seen that oats beat wheat by 1 maund 20 seers per acre.

Transplanted paddy.

The climatic conditions for transplanted paddy were very favourable owing to timeld rainfall in the year under report. *Indrasail* (Dacca No. 1) was grown on 19·45 acres any gave an average outturn per acre of 17 maunds and 6 seers.

Jasoa, a local variety, was also tried on 2 acres and gave an average outturn per acre of 15 maunds 13 seers.

Silo and silage.

To supplement the fodder supply in December and January when the scarcity of green fodder is likely to be felt green maize from 7 acres was preserved in the silo. The silage was excellent and the cattle consumed it with great relish.

Exhibitions.

A butter making demonstration was given at exhibitions held at Pabna and Malda. Much interest was taken by the public.

Practical training in Agriculture.

Four young men have been taken for practical training in dairing and agriculture.

Financial Statement for 1921-22.

Receipts.	Rs.	A.	P.	Expenditure.	Rs.	A.	P.
Amount credited into the treasury ...	4,342	3	6	Establishment	5,154	5	11
Credited by book transfer ...	156	14	0	Travelling allowance ...	340	7	3
By stock transfer ...	33	15	0	Recurring expenditure—purchase and feed of cattle ...	13,999	12	3
Stock in hand on the 1st April ...	673	6	0	Purchase of seeds, manures and implements	4,849	15	9
Bills outstanding for farm produce ...	132	10	3	Wages of farm labourers ...	9,429	14	9
				Petty construction and repairs	2,544	11	9
Total ...	5,339	0	9	Service postage and telegram charges	75	0	0
Deduct the value of previous year's farm produce ...	225	9	3	Purchase of furniture ...	17	1	0
				Office expenses and miscellaneous	2,248	2	9
Total ...	5,113	7	6	Medical aid	215	8	5
Bills outstanding for previous year's farm produce ...	573	7	6	Total ...	33,380	2	0
Grand Total ...	5,686	15	0	Grand Total ...	38,874	15	1

Visits and inspection.

In the year under report the farm was visited by the Hon'ble Syed Nawab Nawab Ali Choudhury, Khan Bahadur, C.I.E., the Minister in charge of Agriculture and Industry, Bengal. The farm was visited several times by the Director of Agriculture, Bengal, and twice by the Superintendent of Civil Veterinary Department, Bengal.

Staff.

Babu Atal Behari Sen, B.Ag., Superintendent, was in charge of the farm under the direct control of the Deputy Director of Agriculture, Northern Circle, throughout the year. He was assisted by two Assistant Superintendents, four Overseers and one clerk. The Assistant Superintendent, Babu Jatindra Mohan Ganguli, was transfered to the Rajshahi Farm in January last and Babu Jnanada Kanta Choudhury was transferred from Rajshahi and placed in his place in charge of cultivation. Jnanada Babu is discharging his duties with zeal and enthusiasm.

It is gratifying to note that the improvement in the cattle and economy in the management were due to the hearty co-operation and good work that I have received from the staff.

J. N. SIRKAR,

Offg. Deputy Director of Agriculture,
Northern Circle, Bengal.

The 16th April 1922.

APPENDIX XVII.

ANNUAL REPORT OF THE DEMONSTRATION FARM, RANGPUR, FOR THE YEAR 1921-22.

Introductory.

The farm is situated in the town of Rangpur and was started by the District Agricultural Association with the object of carrying out experiments in agriculture. It was made over to the Department of Agriculture, Bengal, in the year 1911, since then it has been used for comparative trials with different manures and seeds recommended by the Experts against the best local varieties and also for the multiplication of improved seeds for distribution amongst the cultivators of the district.

Area.

The farm has an area of 19·16 acres of land, out of which 16 acres are under cultivation ; the rest being occupied by roads, drains, pathways and buildings, etc.

Soil.

The soil of the farm is a rich moist loam of light texture with a sub-soil of pure sand at a depth of about 7 feet.

The rainfall and character of the season.

The rainfall during the year under report was as follows :—

Month.	Actual rainfall.		Normal rainfall.	
	Amount of rainfall.	Number of rainy days.	Amount of rainfall.	Number of rainy days.
1921.				
April	2·47	7	3·01	4·3
May	7·08	13	10·66	11·5
June	13·51	14	18·00	15·7
July	32·01	19	15·89	15·0
August	4·73	11	12·80	15·7
September	17·05	15	14·24	13·3
October	8·66		4·87	4·4
November	Nil	Nil	0·12	0·2
December	Nil	Nil	0·05	0·2
1922.				
January	1·19	3	0·50	0·9
February	Nil	Nil	0·50	1·2
March	3·75	3	1·25	1·8
Total ...	90·45	91	81·93	92·2

The weather condition was on the whole good for crops but the scanty rainfall in the month of August retarded the transplanting of the double cropped area.

Trials.

Varietal test—

(*a*) Aus paddy—Kataktara *vs.* Chapalo and Sonamail (local).
(*b*) Winter paddy—Indrasail *vs.* Jasoa (local).
(*c*) Jute—D.-154 *vs.* R.-85 and K. B.
(*d*) Potato—Darjeeling *vs.* Shillong and Country.
(*e*) Wheat—Gangajali (local) *vs.* Pusa No. 12.

Experiments.

A. Irrigation experiments with wheat, barley and oats.
B. Manurial experiments on potato—Special Fertiliser (from Messrs. Shaw Wallace & Co.) No. 1 and 2 *vs.* cowdung and castor cake.
C. Spacing experiments on potato.
D. Plant weeding of kalai and mustard.
E. Cultivation of flax.

Non-experimental.

In addition to the above the following crops were also grown :—

(*a*) Aus paddy for seed.
(*b*) Winter paddy for seed.
(*c*) Jower for fodder.
(*d*) Oats and peas for fodder.
(*e*) Khesari for fodder.
(*f*) Lentils.
(*g*) Mustard.

Demonstrations.

(*a*) *Aus paddy.—Kataktara* was tried against two local varieties—*Sonamail* and *Chapalo* on the same system as last year. The table put below proves that *Kataktara* gave an increased outturn of 4 maunds 38 seers over *Chapalo* and 5 maunds 13 seers over *Sonamail* per acre.

Variety.	Number of plot.	Area in acre.	Outturn per acre.
			Mds. Srs.
Kataktara	16	·80	19 13
Sonamail	8	·40	14 0
Chapalo	8	·40	14 15

(*b*) *Winter paddy.—Indrasail* was grown against local variety *Jasoa*. For want of sufficient water in the plots, weeds were abundant and the growth and tillering of the plants were much affected. In consequence the results were not satisfactory but are given below :—

Variety.	Number of plots.	Area in acre.	Outturn per acre.
			Mds. srs. chs.
Indrasail	6	·30	12 20 0
Jasoa	6	·30	13 13 5

(*c*) *Jute* (*C. Capsularis*), *Varietal tests.*—D-154 was tried against R-85 and K. B. this year also. The table given below shows that D-154 gave a better outturn than others.

Number of Sub-plots.	Variety.	Area in acre.	Outturn per acre.	Average outturn per acre.	Remarks.
			Mds. srs.	Mds. srs. chs.	
1	R-85	$\frac{1}{10}$	22 0	.....	...
2	D-154	$\frac{1}{10}$	23 0	23 31 4	D-154
3	K. B.	$\frac{1}{10}$	19 10	.....	...
4	D-154	$\frac{1}{10}$	17 30	.....	...
5	R-85	$\frac{1}{10}$	13 5	17 22 8	R-85
6	D-154	$\frac{1}{10}$	24 15	.....	...
7	K. B.	$\frac{1}{10}$	24 15	21 32 8	K. B.
8	D-154	$\frac{1}{10}$	30 0	.....	...

(*d*) *Potato.*—Three varieties of potatoes were tried this year. The space between two rows from centre to centre was 21". The cultivators of the districts keep a space of 36" between two rows. The result is tabulated below :—

Variety.	Area in acre.	Outturn per acre.
		Mds. srs. chs.
Country	·20	61 20 0
Shillong	·20	38 5 0
Darjeeling	·20	118 17 8

(*e*) *Wheat.*—Two varieties of wheat Pusa 12 and *Gangajali* were grown. The crop was still in the fields at the time of writing this report but Pusa wheat seemed to be more prolific.

(*f*) *Sugarcane.*—Yellow *Tanna* was grown in ·90 acres. There was ratoon canes also of the following varieties grown in ·90 acres. Yellow *Tanna*, stripped *Tanna*, red Mauritius, B-147, B-3412 and Dacca *gandari*.

The yellow *Tanna* canes were chiefly grown for propagation of cuttings to meet the district demand which is very great.

Experiments.

A. Irrigation experiments on wheat, barley and flax was undertaken to find out whether these crops can be grown at a profit with irrigation but this was not necessary as there was sufficient moisture throughout the whole season.

B. *Manurial experiment on potato.*—The experiment was conducted on a plot which was previously cropped in the *Bhadoi* season—with jute for the multiplication of seeds. In consequence of its being harvested late the potatoes could not be sown in proper time and the experiment failed.

C. *Spacing experiments on potato 21" and 36" apart*:—

Variety.	Area in acres.	Space between rows.	Outturn per acre.
		Inch	Mds. srs.
Country	$\frac{1}{20}$	36	65 20
Do.	$\frac{1}{20}$	21	80 0
Do.	$\frac{1}{20}$	36	59 0
Do.	$\frac{1}{20}$	21	101 20

This experiment will have to be repeated.

D. Plant selection on mustard and *Kalai* was conducted by the Economic Botanist under his personal supervision.

E. *Flax.*—The Fibre Expert conducted these experiments to see if good flax straw could be grown. They will be continued.

Non-experimental.

Aus paddy.—*Kataktara aus* paddy was grown on 3·53 acres of land for multiplication. A total outturn of 69 maunds 9 seers and 8 chittaks of pure seed was obtained.

Winter paddy.—*Indrasail* paddy was grown on 3·23 acres of land for multiplication. An outturn of 51 mounds 7 seers and 8 chattaks of pure seeds was obtained.

Crops for fodder—(*Jower, Khesari, Oats and peas*).—*Jower* was grown on ·92, Khsari on 4·06, and peas (mixed) on 1·90 acres and fed to the cattle in the green stage.

Lentil and mustard—Were grown on 1·60 and 1·06 acres. respectively, as catch-crops

Seed distribution.

The following seeds were supplied from the farm—

	Mds.
1. Indrasail paddy	46¼
2. *Kataktara aus* paddy	80
3. Jute (D-154.)	2½
4. Yellow Tanna cuttings	9,500 sets.

Cattle.

There are 3½ pairs on the farm which are insufficient for efficient cultivation and three more bullocks will have to be purchased this year.

Stud bull.

A half-bred stud bull raised on the Government Cattle Farm has been obtained in the year under report with a view to enable the local people to use him for their cows and thus in time to improve the local breed.

Establishment.

The farm was directly under the charge of the District Agricultural Officer, Rangpur, and throughout the year he was helped by an Overseer, Babu Prafulla Ranjan Sen, who worked with his accustomed zeal.

Inspection.

The Hon'ble Minister in charge of the Department visited the farm once. The Director of Agriculture, the Economic Botanist, the Agricultural Chemist and the Fibre Expert to the Government of Bengal, visited the farm several times and the Deputy Director of Agriculture, Northern Circle, frequently, during the year under review.

Financial statement of the Rangpur Demonstration farm for 1921-22.

Receipts.	Rs.	A.	P.
Amount credited into the Treasury	750	11	9
Amount adjusted by book transfer	82	4	6
Amount adjusted according to Article 97, C. A. C. ...	299	3	3
Value of stock in hand on 31st March 1922 including live-stock, furniture implements etc	1,854	0	6*
Total ...	2,986	4	0
Deduct—			
Value of farm produce of 1920-21, sold and realised during this year ...	109	9	0
Realised amount on account of bills outstanding for produce of 1920-21. ...	38	7	0
Realised amount on account of bills outstanding for produce of 1919-20 ...	10	1	0
Amount adjusted by book transfer for produce of 1920-21	68	0	0
Amount adjusted according to Article 97, C. A. C., for produce of 1920-21 ...	48	4	0
	274	5	0
Grand Total ...	2,711	15	0

Expenditures.	Rs.	A.	P.
Establishment—			
One Overseer and one Peon ...	624	8	0
Contingencies—			
Purchase and feed of cattle ...	435	15	3
Purchase of seeds, manures and implements	288	13	0
Wages of labourers for cultivation	1,850	0	0
Reclamation	139	14	6
Petty constructions and repairs	345	0	0
Rent, rates and taxes ...	91	5	0
Office expenses and miscellaneous	219	15	9
Service postage stamps and telegram charges ...	15	0	0
Value of live-stock received from cattle farm ...	150	0	0
Value of stock received and the amount adjusted according to Article 97, C. A. C. ...	8	3	0
Total ...	3,544	2	6†

	Rs.	A.	P.
* Value of live stock ...	930	0	0
Furniture and implements ...	596	6	6
Value of other stores ...	27	1	0
Value of farm produce ...	500	9	0
	1,854	0	6

† Out of this amount Rs. 140 was capital expenditure for sinking a *pucca* well in the Overseer's quarter.

J. N. Sarkar,

Offg. Deputy Director of Agricultere,
Northern Circle.

APPENDIX XVIII.

ANNUAL REPORT OF THE BURIRHAT FARM FOR THE YEAR 1922-23.

Introductory.

This farm is situated on the border of the important tobacco-growing belt in the district of Rangpur. It is 5 miles from the Rangpur town. The total area of the farm is 52 acres, of which 28 acres are under cultivation and the rest are occupied by buildings, curing sheds, grazing grounds, roads and tanks, etc.

Soil.

The soil of the farm is a sandy loam with a sandy sub-soil. Though originally poor the soil is gradually improving on account of systematic methods of cultivation, but there are a few barren patches which are occupying special attention. The water level does not go deeper than 15 feet in the hot weather.

Season.

The season was not on the whole an unfavourable one for tobacco. In spite of heavy downpours during the months of August and September the tobacco seedlings were grown in time in the nursery with much care.

There was practically no rain during the tobacco-growing season, and this told upon the general condition of the crop to some extent. The harvesting of the tobacco crop was almost complete by the third week of March and thus there was no damage from the light showers with hailstones which occurred on the 21st March.

Table showing the rainfall during the year.

Months.	Actual during the year.		Normal.	
	Rainfall.	Number of rainy days.	Rainfall.	Number of rainy days.
April 1921 ...	4·88	6	3·01	4·3
May „ ...	6·63	9	10·63	11·5
June „ ...	24·22	14	18·00	15·0
July „ ...	25·61	19	15·89	15·0
August „ ...	14·91	6	12·80	13·7
September „ ...	18·63	14	14·24	13·3
October „ ...	5·91	5	4·87	4·4
November „ ...	...	...	·12	·2
December „ ...	...	...	·05	·2
January 1922 ...	·43	1	·05	·9
February „ ...	...	...	·54	1·2
March „ ...	·1	1	1·25	1·8
Total ...	101·32	75	81·48	81·5

Operations during the year.

(*a*) *Kharif.—Kataktara aus* paddy was grown on the farm for multiplication and also for comparative trials with the local heavy-yielding variety of *aus* named Sonamail. The total area under *aus* paddy was 6·9 acres, and the average yield of *Kataktara* was 5 maunds 30 seers more than that of local *aus* per acre.

(*2*) *Green manuring.*—For improving the soil, green manuring with sunn hemp and cowpea was continued this year. There were 2·2 acres under cowpea and 15·78 under sunn hemp. The latter was attacked by red ermine moth and partly damaged by it.

(*3*) *Fodder crops.*—Joar as fodder was grown on 2·5 acres of land.

Rabi (*b*) (*1*)—*Tobacco* (*a*) *Local Bhengi.*—The main crop of the season is tobacco. Different experiments were carried on with local Chilakhal Bhengi to ascertain the manurial requirements of this crop and its response to the application of artificials. The results are appended below. There were 2·1 acres under this variety.

Bhengi has proved to be the heaviest yielder and fetches the highest price from the Burmese dealers who make the well-known "Burmese cheroots" out of this variety.

(*b*) *Sumatra Tobacco.*—The reputation of Sumatra tobacco grown from the carefully selected seeds of this farm as a cigar wrapper has now been established in the market. Prices obtained ranged from Re. 1 to Rs. 2 per lb. There were 1·16 acres under this variety.

Twenty-two maunds of tobacco leaves of the Sumatra variety are still in hand. Two-thirds of this quantity will be required for cigar-making on our own farm. Owing

to the recent railway strikes no tobacco leaves could be despatched to Madras and other markets and hence the rest is still lying in stock.

(*c*) *Cigar-filler tobacco.*—A better filler than Sumatra is wanted to establish cigar-making as a successful enterprise. Experiments are now being carried out with newly imported filler varieties with this end in view.

Five new varieties were introduced during the year, of which four are exotic—

Pennsylvania (U. S. A.)
Mauritius (Mauritius).
Manilla Nos. 1 and 2 (Phillipines).
Burmese Havana (the Havana variety of Cuba acclimatised in Burma).
Thotnompotti (Madras).

4. The seeds of the Manilla and Mauritius varieties, procured, were not good. However, seeds were selected here from the best plants that germinated and preserved for cultivation next year. Of the newly introduced varieties Manilla No. 2 seems to be the most promising.

Besides the above five varieties, there were some other varieties from Madras, namely, Buchi, Nellore and Caulifiller. They are not good yielders and consequently their cultivation will no longer be continued.

An area of ·9 acre was under these varieties this year.

(*d*) *Cigarette tobacco.*— The following varieties were tried—Ohio, Mauritius, Orinoco and White Burley.

Ohio and Mauritius were introduced during the year. Ohio is a promising variety, but is too course. In the non-experimental area Yellow Prior and a Turkish variety were grown. There were nearly ·65 acre in all under these varieties.

2.—Lentils.

There were 2·8 acres under lentils. As was the case last year this crop did not thrive well and consequently will be discontinued next season.

3.—Oats and Peas.

Oats and peas are being cultivated on this farm as fodder crops. This year they were grown on 16·78 acres. There was a very bad attack of rust on the crop. The cultivation of oats will therefore be stopped and maize and joar grown next year. The construction of a silo will then be required for preservation of the fodder which can then be utilised in the dry season.

EXPERIMENT SERIES I.

Crop—Bhengi tobacco.

Nature of experiments—Green manuring. The actual dry weight of the crop obtained in separate plots are given below :—

Sunn hemp as green manure.	Cowpea and 60 lbs. superphosphate per acre at the time of sowing green manuring crop.	Cowpea and 60 lbs. superphosphate per acre before transplanting.	200 maunds of cowdung per acre.
16 seers.	**21 seers.**	**26 seers.**	**28½ seers.**

Cowpea as green manure.	100 maunds of cowdung per acre.	Cowpea as green manure and 75 maunds of cowdung per acre.	150 maunds of cowdung per acre.
18 seers.	**24 seers.**	**24 seers.**	**25 seers.**

Cowpea as green manure and 75 maunds of cowdung per acre.	150 maunds of cowdung per acre.	Cowpea.	Cowdung 100 maunds per acre.
18 seers.	**20 seers.**	**20 seers.**	**22 seers.**

Cowpea and 60 lbs. superphosphate per acre before transplanting.	200 maunds of cowdung per acre.	Sunn hemp.	Cowpea and 60 lbs. superphosphate per acre at the time of sowing green manure crop.
9 seers.	**18½ seers.**	**15 seers.**	**14 seers.**

The upper two series had better soil. This experiment was conducted with a view to seeing the comparative effect of green manuring and cowdung. The effect of superphosphate in combination with the green manure was also observed.

EXPERIMENT SERIES II.

Crop—Bhengi tobacco.

Nature of experiments—Manurial. Each plot $\frac{1}{20}$th of an arce actual outturn given (dry weight).

Sunn hemp and 150 maunds of long tobacco stems per acre applied before transplanting.	Sunn hemp and 150 maunds of ground tobacco stems per acre applied before transplanting.	Sunn hemp as green manure and 150 maunds of cowdung per acre applied before transplanting.
18 seers.	**17½ seers.**	**25 seers.**

Sunn hemp as green manure and 150 maunds of cowdung per acre applied before transplanting.	Sunn hemp and 150 maunds of long tobacco stems per acre applied before transplanting.	Sunn hemp and 150 maunds of ground tobacco stems per acre applied before transplanting.
29 seers.	**18 seers.**	**15 seers.**

The experiment was designed to ascertain the value of tobacco stems as a manure. From the result it appears that tobacco stems are not of much value.

OROBANCHE EXPERIMENT.

Each plot $\frac{1}{20}$th of an acre.

Manuring 150 maunds of farmyard manure and 5 maunds of oilcake per acre actual outturn given (dry weight).

Orobanche Nicotiana, known commonly as Broom rape, is a parasite of tobacco attacking the roots.

Unburnt plot 9191, Orobanche removed.	Burnt plot 10950, Orobanche removed.	Unburnt plot 7768, Orobanche removed.
22¼ seers.	**24¼ seers.**	**26 seers.**

Burnt plot 15835, Orobanche removed.	Unburnt plot 5607, Orobanche removed.	Burnt plot 5712, Orobanche removed.
19½ seers.	**27½ seers.**	**24½ seers.**

The experiment was carried with a view to find out if the effect of burning could check the attack of this parasite and was done in collaboration with the Imperial Mycologist.

The ashes in the burnt plots seemed to be beneficial to the growth of Orobanche and hence the number of parasites grown in the burnt plots was greater than that in the unburnt plots.

EXPERIMENTAL SERIES III.

Plot $\frac{1}{20}$th of an acre.

Crop—Bhengi tobacco.

This experiment was devised to test the needs of plants as regards nitrogen, phosphoric acid, potash and lime.

The actual outturns of tobacco crop are given (dry weight).

150 maunds cowdung and 8 maunds of lime per acre. **17 seers.**	150 maunds of cowdung 8 maunds of lime and 1 maund of sulphate of ammonia per acre. **15½ seers.**
150 maunds of cowdung, 8 maunds of lime and 75 lbs. of potassium sulphate per acre. **18 seers.**	150 maunds of cowdung and 8 maunds of lime per acre. **13 seers.**
150 maunds of cowdung, 8 maunds of lime and 3 maunds of bonemeal per acre. **17 seers.**	150 maunds of cowdung, 8 maunds of lime and 75 lbs. of potassium suphate. **14 seers.**
150 maunds of cowdung, 8 maunds of lime, 75 lbs. of potassium sulphate and 3 maunds of bonemeal per acre. **26 seers.**	150 maunds of cowdung, 8 maunds of lime and 3 maunds of bonemeal per acre. **24 seers.**
150 maunds of cowdung, 8 maunds of lime, 1 maund of sulphate of ammonia per acre. **18 seers.**	150 maunds of cowdung, 8 maunds of lime, 75 lbs. of potassium sulphate and 3 maunds of bonemeal per acre. **16 seers.**

Seed selection.

The selection of best tobacco plants for seed by bagging flowers is being continued with good results and there is great demand for our seed. Tobacco seed to the value of Rs. 67-6-6 were sold during the year under report.

Seedlings.

Seedlings of Sumatra Bhengi and Motihari were given free to many people of Burirhat, Chengmari and Chilakhal.

Labour.

During the busy season the question of labour gave considerable trouble. Local labour is not available as every one has his own tobacco field. As the harvest was good, very few coolies migrated from Behar this year.

Practical training.

There are four apprentices at present undergoing training in the cultivation and curing of tobacco. During the year one apprentice left and started a private enterprise in cigar-making. Two Chittagong Hill Tracts boys joined the farm for training in the middle of January. One student from Sabour Agricultural College came to see curing, etc. Just at the closing of the year a demonstrator from Bakarganj was sent to undergo training in curing.

Manufacture of cheroots.

The demand for Burirhat cigars far exceeds the supply. This year more than Rs. 2,200 worth of cigars have been sold. We have many permanent customers in the Punjab

Bombay Presidency, United Provinces, Bihar and Orissa, Bengal and Central Provinces, but the farm output is limited. A statement is attached showing the total outturn and the expenditure on this account during the year.

The farm cigar-roller gave demonstrations at Malda and Dacca.

Cattle.

There are at present 15 bullocks, two of which were purchased during the year. One bullock died in January of old age.

Two stud bulls have been sent to this farm from the Rangpur Cattle Farm.

Visits.

The farm was visited by (1) the Hon'ble Nawab Syed Nawab Ali Chaudhuri, Khan Bahadur, C.I.E., Minister of Agriculture, (2) Director of Agriculture, (3) Registrar of Co-operative Societies and (4) the Collector of Rangpur.

The Agricultural Chemist, Bengal, and the Deputy Director of Agriculture, Northern Circle, came to this farm frequently in connection with the experimental work.

Establishment.

Babu Kamini Kumar Lahiri, B.Ag., and Babu Mohini Mohan Ghosh held the charge of the office of the Farm Superintendent, respectively, up to April and June last.

Babu Amrita Lal Mukherjee took over charge from Mohini Babu in June and since then he has been working as the Superintendent. There is no change in the other staff.

STATEMENT SHOWING THE RECEIPTS AND EXPENDITURE OF THE BURIR-HAT FARM DURING THE YEAR 1921-22.

Receipts.

		Rs.	A.	P.	Rs.	A.	P.
1.	Amount remitted into Treasury ...	3,981	0	9			
	Deduct—Outstandings of previous years realised during the year... ...	170	6	0			
					3,810	10	9
2.	Bills outstanding	358	5	0			
	Deduct—Outstandings of previous years	314	0	0			
					44	5	0
3.	Articles supplied (*vide* Article 97, C. A. C.)	156	8	0			
	Deduct—Articles supplied during previous years (*vide* Article 97, C. A. C.)	76	0	0			
					80	8	0
4.	Value of stock in hand on 31st March 1922	3,568	2	0			
	Deduct—Value of previous year's stock	1,453	14	0			
					2,114	4	0
5.	Value of fodder produced and used in farm				416	0	0
					6,465	11	9

Expenditure.

		Rs.	A.	P.
1.	Purchase and feed of cattle	637	10	9
2.	Purchase of seeds, manures and implements ...	586	13	0
3.	Wages of labourers	4,192	4	6
4.	Petty construction and repairs	835	10	3
5.	Cost of medical aid	78	15	6
6.	Service postage stamps	125	0	0
7.	Miscellaneous	1,533	4	0
		7,989	10	0
	Amount written off under Director's authority ...	401	14	0
		8,391	8	0

J. N. SIRKAR,

Offg. Deputy Director of Agriculture,
Northern Circle, Bengal.

APPENDIX XIX.

ANNUAL REPORT OF THE RAJSHAHI FARM FOR THE YEAR 1921-22.

Introduction.

The farm is situated on the north of the Rajshahi town and has an area of 63 acres, 53 acres are under cultivation ; and the rest are occupied by buildings, roads, tanks and grazing lands.

Improvement.

Plot 63 has been further raised during the year to make it more suited to the cultivation of sugarcane.

The whole farm has been surveyed during the year to mark the position of different blocks and plots accurately. This has been done, as a preliminary, for a general laying out.

Nine mango grafts have been planted during the year of the following varities :—
Bombay | Gopalbhog
and Isanbhog.

Soil.

An analysis of the farm soil was done by Dr. Leather in 1907. A recent analysis of the farm soil which has already been undertaken by the Agricultural Chemist, Bengal, has not been completed as yet. In 1907 the farm was found rich in lime and very deficiene in phosphoric acid, potash and organic matter.

Season and rainfall.

Months.	Rainfall in inches 1921-22.	Normal rainfall in inches.	Rainfall in inches 1920-21.
1921.			
April	4·46	10·80	Nil
May	2·63	5·56	2·20
June	9·84	10·81	6·73
July	12·79	11·45	10·86
August	15·91	10·75	6·73
September	9·19	10·40	9·90
October	0·70	4·46	3·38
November	Nil	0·31	Nil
December	„	0·06	„
1922.			
January	0·12	0·34	1·54
February	0·32	0·89	Nil
March	Nil	1·15	1·40
	55·96	66·93	42·42

Character of season.

The season was unfavourable to the transplanted paddy and *rabi* crops. *Bhadoi* sowings were started in goods time, as there were showers in March and April. The drought in May affected the young plants of both jute and paddy, badly. The transplanting of paddy could not be commenced till the end of July and the rains stopped soon after the middle of September. The proper growth and flowering were checked, to a considerable extent, owing to the want of good showers in the middle of October. Owing to the early cessation of rains the *rabi* lands had not sufficient moisture at sowing time, and there being continuous drought during the season, this deficiency could not be made up ; all the *rabi* crops, therefore, suffered more or less.

Operations during the year.

The following experiments were done during the year :—

(*a*) Sugarcane varietal test Yellow tanna Vs. J-247.
(*b*) Varietal test with Kataktara Vs. two local varieties of aus paddy.
(*c*) Plant-breeding experiments by the Econonic Botanists.
(*d*) Irrigation experiments on wheat.
(*e*) Gram—(1) pruning trial, (2) sowing trial,—drilling Vs. broadcast.

Sugarcane.—Testing Yellow tanna against J-247 the test was arranged in duplicate plots. The area of each plot was 0·11 acres and there were 11 lines of canes in each.

J-247 has yielded more though the variety was found attacked with disease. It was noticed to mature earlier than the other variety. The results are given below :—

Variety of cane.	Plot No.	Area in acres.	Actual weight of cane.	Actual weight of juice.	Actual weight of *gur*.	Yield of *gur* per acre.
			Mds. Srs.	Mds. Srs.	Mds. Srs.	Mds. Srs.
J-247 ...	C5(*a*)	0·11	41 21	24 20	4 11	28 39
Yellow tanna ...	Do.	0·11	30 35	19 20	3 1	27 26
J-247 ...	C5(*b*)	0·11	49 4	30 30	3 38	36 2
Yellow tanna ...	Do.	0·11	33 2	24 20	3 37	35 27

The general yield has been very poor. This is due to the poorness of the soil and unusual drought since October.

(*b*) *Varietal test with aus paddy.*—The test was arranged in duplicate plots and Kataktara was tried against two heavy yielding varieties of local aus paddy. The results of outturn are given below :—

Variety of aus.	Plot No.	Area in acre.	Yield per acre.
			Mds. Srs.
Kasiapanja ...	1	0·05	11 0
Marichbuti ...	2	0·05	17 20
Kataktara ...	3	0·05	23 10
Kasiapanja ...	4	0·05	15 0
Marichbuti ...	5	0·05	20 0
Kataktara ...	6	0·05	23 11

During the young stage some Kataktara plants died. Kataktara has beaten both the local varieties in yield. Marichbuti has coarse grains and Kasiapanja is rather finer.

(*c*) *Plant-breeding experiments.*—Mr. Hector conducted his experiments with Matikalai. The plants in general were severely attacked by a small insect and suffered very badly.

Mr. Dutt conducted his experiments on the following crops during the year :—Pea, Masur, Khesary and Linseed. The khesary plants in general devoloped a curly appearance in the middle of December. There were 0·3 inches of showers in the first week of February, and the disease got a set beck, the plants assuming a normal appearance again. Experiments with Til are also being conducted here

(*d*) *Irrigation trial on wheat crop.*—Two plots of Pusa 12 wheat near the well in block A, were selected. The area of each plot was 0·1 acre. The northern plot was irrigated once during the latter part of January. The water was lifted from well by means of buckets and put into a kutcha channel leading to the plot. The plot was soaked with water, but could not be totally flooded.

The actual outturns obtained in the irrigated and unirrigated plots are, respectively, 20 seers 4 chataks and 10 seers 14 chataks, *i.e.*, 5 maunds 2½ seers and 2 maunds 28¾ seers per acre.

The yield has been very poor, owing to the extreme drought prevailing throughout the whole season, and inadequate means of irrigation.

Crops grown during the year.

1. Yellow tanna sugarcane.
2. Kashiapanja aus paddy.
3. Indrasail transplanted paddy.
4. Tobacco, Motihary and Bhengi.
5. Wheat Pusa 12.
6. Gram.
7. Masur.
8. Khesary.
9. Darjeeling potato.
10. Linseed.

Attempts are being made to select out one of the liguminous weeds (melilotus) as a fodder crop. Selections have alse been made from Khesary. Four different types of Khesary have been selected during the year. Observations on them will be continued until definite results are obtained.

Pusa wheat 12 has been carefully selected and sufficient pure seed kept for next year's sowings.

Seeds distributed among the cultivators.

Indrasail	... 40 mds. 15 seers.
Pusa wheat No. 12	... 40 „ 13 „
Yellow Tanna sugarcane ...	... 65,700 sets.

Miscellaneous.

(*a*) *Cattle.*—During the year six male buffaloes were purchased. The stock now numbers 20, of which, 14 are bullocks.

(*b*) *Breeding bull.*—Two stud-bulls were brought here during the month of October. They were bred at the Rangpur Cattle Farm and are meant for use on privately-owned cows.

Training in practical Agriculture.

There was one apprentice during the year. He was sent here by the Collector of Malda. His training of one year was completed in March 1922.

The Rajshahi College sent some of their students to the farm. The course comprises 30 lectures on elementary agriculture. The usefulness of the use of improved seeds, manures and implement was explained by practical demonstrations, whenever possible. The class was held every Sunday morning, and the lecture was followed by practical work in the field. An old implement shed was improvised, so as to be used as a lecture-room.

Inspection and visits.

The farm was frequently visited by the Deputy Director of Agriculture and the Superintendent of Agriculture. The Director of Agriculture and the Economic Botonists visited the farm, as often as possible. The Hon'ble Minister of Agriculture visited the farm once. The Collector visited the farm frequently. The cultivators, zeminders and local gentlemen interested in agriculture also visited the farm in numbers.

Establishment.

Babu Charu Chandra Sanyal held the charge of this farm up till 16th June, when Babu Mohini Mohan Ghosh took over charge from him; Babu Utpal Sirkar relieved Babu Mohini Mohan Ghosh on the 27th December and has been holding charge since. The Superintendent was assisted by one Assistant Superintendent, one overseer and one clerk.

ASSETS.

	Rs.	A.	P.	Rs.	A.	P.
1. Amount credited into treasury ...	4,349	0	0			
Deduct value of previous year's farm produce realised during the year ...	633	8	9	3,715	7	3
2. Amount adjusted by book transfer ...	1,145	7	0			
Deduct amount adjusted for previous year's farm produce ...	310	5	6	835	1	6
3. Amount adjusted under article 97, Civil Account Code ...	290	15	0			
Deduct amount ad justed for previous years for produce	217	11	0	73	4	0
4. Bill outstanding ...	1,754	12	3			
Deduct bills outstanding for previous year's farm produce ...	1,172	9	9	582	2	6
5. Stock in hand on 1st April 1922 ...	...			1,153	1	9
Total ...	...			6,359	1	0

EXPENDITURE.

	Rs.	A.	P.
1. Purchase of cattle ...	335	8	0
2. Feed of cattle	807	11	9
3. Purchase of seeds ...	217	1	0
4. Purchase of manures ...	950	3	9
5. Purchase of implements ...	400	12	6
6. Labour charge for cultivation	4,000	0	0
7. Labour charge for reclamation	449	7	0
8. Service postage and telegraph charge	80	0	0
9. Petty construction and repairs	337	6	9
10. Cost of medical aid ...	22	10	6
11. Purchase and repair of furniture	15	10	0
12. Miscellaneous	479	6	0
Total ...	8,095	13	3

J. N. SIRKAR,

Offg. Deputy Director of Agriculture,
Northern Circle, Bengal.

The 18th April 1922.

APPENDIX XX.

THE ANNUAL REPORT OF THE BOGRA DISTRICT FARM FOR THE YEAR 1921-22.

Introductory.

The farm is situated on the western side of the Bogra town within a short distance of the railway station. The soil consists entirely of heavy red laterite known as *khear* and representing the typical paddy-growing soils of the western half of the district.

Of the total area, 22·9 acres are under cultivation; the rest being occupied by roads drains, a tank and buildings.

The land is only really suitable for transplanted Aman paddy, but high land crops were also tried, and 4·75 acres were put under *rabi*. The construction work of the farm is not yet complete as the necessary coolie sheds, implement shed, threshing floor, permanent fencing and levelling of the surrounding *bunds* have not yet been taken in hand for want of sufficient funds. At present we have got a tank in the middle of the farm with the following buildings on its surroundings :—

(1) One combined office, godown and Inspection room.
(2) One District Agricultural Officer's quarters.
(3) Three Fieldman Demonstrators' quarters.
(4) One cattle shed.
(5) One covered manure-pit for the conservation of cowdung.

Stud-bull.

A cross-bred stud-bull was sent here from Rangpur Cattle Farm with a view to improving the local strain. The people, however, did not show much inclination to have their cows served and to pay annas 8 as fee, and accordingly the Director of Agriculture Bengal, in a recent circular has ordered free service until further notice.

Season and rainfall.

The season though favourable during paddy transplantation time was not seasonable during the remaining period of the year. From the rainfall record shown in the table below, it will be noticed that the transplanted paddy was affected for want of October showers during the development of its grain. *Rabi* crops also suffered all along from want of rain during the growing season.

Rainfall.

Months.	Rainfall in inches in 1921-22.	Normal rainfall.	Departure from normal.
1921.			
April ...	2·92	2·40	+ 0·52
May ...	7·43	8·66	– 1·23
June ...	9·11	13·81	– 4·20
July ...	13·40	13·40	Nil
August ...	11·98	12·63	– 0·65
September ...	12·91	10·97	+ 1·94
October ...	1·70	4·31	– 2·61
November ...	Nil	0·60	– 0·60
December ...	„	0·09	– 0·09
1922.			
January ...	0·12	0·12	– 0·30
February ...	0·25	0·88	– 0·63
March ...	Nil	1·11	– 1·11
Total ...	59·82	69·28	– 9·46

Crops grown in the farm with area.

	Crop.	Area in acre.
1.	Tana sugarcane for sets	0·3
2.	D-154 jute for seed	1·7
3.	Kataktara aus for seed	1·3
4.	Kataktara Vs. local aus (as varietal test)	0·6
5.	Jower for fodder	0·3
6.	Indrasail paddy for seed	8·18
7.	Indrasail paddy Vs. local aman (as varietal test) ...	2·2
8.	Manurial test on transplanted aman paddy—	
	(*a*) Bonemeal Vrs. Cowdung	0·6
	(*b*) Dhancha green manure Vrs. Cowdung ...	1·2
	(*c*) Mustard cake Vrs. Cowdung	0·6
9.	Khesary on standing aman paddy	2·0
10.	Comilla Rahar	0·25 about.
11.	Potato (local Vrs. Darjeeling)	0·6
12.	Mustard	1·6
13.	Lentil	0·15
14.	Irrigation experiment on *rabi* crops—	
	(*a*) Wheat	0·6
	(*b*) Barley	0·3
	(*c*) Gram	0·15
15.	Oats and peas for fodder	0·5

Sugarcane.

Tanna canes were planted on 0·45 acres in all, but only the early planted canes on ·20 acre did well ; the remaining portion which was planted later in April and May did not grow well, and became water-logged during rains. Yellow tanna did better than the striped tanna, and the latter variety was discarded according to the instruction of the Director of Agriculture, while the former variety was used for further propagation on the farm ; about 0·4 acre has been already planted on rather higher land in February 1922 with irrigation. Aftr taking 7,500 sets for planting the remaining portion of the canes were crushed, and we got 6 maunds 32 seers of *gur*, out of it which fetched a higher price than the locally-made *gur*.

Jute D-154.

1·7 acres were put under jute for seed propagation, but a portion of it was ploughed in for bad germination. Another portion suffered badly for water-logging and this was harvested and 6 maunds 7 seers of fibre were extracted from it. The remaining portion was kept for seed and 2 maunds 38 seers seed were obtained.

Varietal test of aus paddies.

The Economic Botanist's Kataktara Aus was tried against two local prolific varieties on ·20 acre of each. The Kataktara proved its superiority over both of the varieties. A statement showing the result is given below :—

Plot No.	Area.	Variety.	Outturn per acre. Mds. Srs. Ch.
98, 104	0·20	Inda (local) ...	6 25 0
99, 101	0·20	Kataktara ...	7 4 6
100, 102	0·20	Sorisaputi (local) ...	6 5 0

Indrasail paddy for seed.

For seed propagation it was grown on 8·13 acres of land. Total pure seed obtained was 133 maunds 11 seers.

Varietal test on aman paddy.

Economic Botanit's Indrasail paddy was tried against a prolific local aman on ·8 acre. The result which is somewhat expected, is given below, but in the Feld Economic Botanist's variety appeared to be marked by superior :—

Plot No.	Area in acre.	Variety.	Outturn per acre. Mds. Srs. Ch.
8, 10, 12, 14, 37, 39, 41 and 43	·8	Local Indrasail ...	19 37 8
7, 9, 11, 13, 16, 36, 38, 40, 42 and 44 ...	1·0	Departmental Indrasail	20 0 8

Manurial test on aman paddy.

Bonemeal and cowdung were applied on 0·4 acre of each for demonstrating of their effect in red laterite soil. Bonemeal gave a very good returns which is shown in the statement below :—

Bonemeal Vs. Cowdung.

Plot No.	Area in acre.	Manure applied.	Outturn per acre.
51, 53, 56 and 58 ...	0·4	Bonemeal at 2 maunds 30 seers per acre ...	27 7 8
52, 54, 55 and 57 ...	0·4	Cowdung at 60 maunds per acre ...	24 2 8

Dhancha green manuring on paddy.

Dhancha green manuring on transplanted aman was also tried side by side with cowdung. Here also the green manured plot gave a distinct better outturn than the cowdung-manured plots. The statement is given below :—

Plot No.	Acres.	Manure applied.	Outturn per acre. Mds. srs. ch.
25, 27, 28, 30, 33 and 35 ...	0·6	Dhancha green manure	19 20 5
24, 26, 29, 31 32 and 34 ...	0·6	Cowdung at 60 maunds per acre ...	16 0 0

Mustard cake on paddy.

When the Hon'ble Minister visited the farm last year some of the cultivators wanted to know the effect of locally available rape cake on transplanted aman paddy. Accordingly it was tried for comparison with cowdung manure on 0·6 acres of land and from the result given below, it will be noticed that the rape cake gave much better outturn :—

Plot No.	Acres.	Manure applied.	Outturn per acre. Mds. srs. ch.
84, 86 and 87 ...	0·3	Mustard cake at 3 maunds per acre ...	16 25 0
85, 88 and 90 ...	0·3	Cowdung at 60 maunds per acre ...	12 10 0

Miscellaneous.

As practised in some of the rich loamy tracts Khesary was sown boardcast in two acres of standing aman paddy in October 1921 to give green fodder for the farm bullocks.

Juar.—·03 acre was put under juar and 48 maunds of green stuff produced which was fed to cattle.

Comilla Rahar was sown alongside the boundary fencing as a trial in Khesary land. The crop grew well and 1 maund 31 seers of seeds was obtained.

Potato.—Darjeeling and local variety was tried on ·06 acre to see whether this crop can profitably be grown on these heavy laterite soils. For want of seasonable showers, heavy irrigation had to be resorted to which augmented the cost of cultivation ; making a trial a financial loss.

Mustard and Lentil were also cultivated to see whether they can be grown profitably in *khear* tract. These also due to abnormal weather conditions, did not give a good outturn.

Oats and peas were grown in 0·5 acre in different portions of the farm land. All had to be irrigated. However, a moderate crop of green fodder was obtained, which was used for feeding farm cattle.

"Irrigation experiments on *rabi* crops."

Experiments were made with wheat, barley and gram. The outturn, although poor, as it was with other *rabi* crops of the year, showed the effect of irrigation in a marked manner. In the case of wheat it gave 2 maunds in barley, 3 maunds 25 seers in gram, 2 maunds 35 seers more outturn per acre than from the non-irrigated ones.

Seed distribution.

The following seeds were supplied to the public from the farm :—

	Name of seed.	Sold.	Supplied.
		Mds. srs.	Mds. srs.
1.	Kataktara aus	9 5	2 0
2.	Indrasail paddy	44 5	67 15
3.	Potato (Darjeeling and local)	22 0	Nil
4.	D-154 jute seed	1 28	,,
5.	Lentil	0 10	,,
6.	Gram	0 5	,,

Staff.

The farm was in charge of the District Agricultural Officer, Bogra, under whom three demonstrators worked. Babu Jogesh Chandra Ray, District Agricultural Officer, held charge up to 21st April 1921, when Babu Pramatha Nath Sen Gupta, took over charge from him. Among these three demonstrators one Babu Jogendra Chandra Das was absent for 8 months and 7 days, being on leave.

Visitors.

The Director of Agriculture, Bengal, visited the farm twice, the Agricultural Chemist once, the Divisional Commissioner twice, and beside it was frequently visited by the Collector of the district.

Financial Statement of Bogra Farm.

Receipts.				Rs.	A.	P.
Sale-proceeds credited to treasury ...				284	13	0
Amount adjusted by book transfer ...				273	8	0
Value of stock supplied and the account adjusted by article 97, Civil Account Code				4	0	0
Value of stock in hand on 31st March 1922				2,206	14	6
Bills outstanding on 31st March 1922				15	12	0
Total ...				2,784	15	6
Deduct				513	3	9
Value of stock in hand on 31st March 1921 ...	460	5	3			
Bills outstanding on 31st March 1921 and realised this year ...	52	14	6			
Total ...	513	3	9			
Grand Total ...				2,271	11	9

Expenditure.	Rs.	A.	P.
Purchase of seeds, manures and implements	606	1	6
Wages of labourers	1,564	9	0
Petty constructions and repairs ...	2,399	11	0
Furniture	50	0	0
Office expenses and miscellaneous ...	298	12	0
Feed of cattle	699	1	9
Value of live-stock received from Rangpur Cattle Farm ...	150	0	0
Value of stock received and the account adjusted according to Article 97, Civil Account Code ...	134	13	6
Total ...	*5,903	0	6

* Out of this Rs. 2,000 was capital expenditure for excavating a tank.

J. N. Sarkar,

Offg. Deputy Director of Agriculture,
Northern Circle, Bengal.

The 14th April 1922.

APPENDIX XXI.

THE ANNUAL REPORT OF THE PABNA DISTRICT FARM, 1921-22.

Introductory.

The farm is situated to the north of the town and just a mile from it, and work was started only this year. It has an area of 20 acres, of which only 5·7 acres have, so far been brought under cultivation. The reclamation of the remaining portion of the farm will be done in the current financial year. The buildings of the farm are all complete. The excavation of the tank was taken up, but could not be finished within the year. The constructions of a threshing shed and a cooly-shed are of urgent necessity.

Soil.

The soil of the farm is a loam with a sub-soil of more or less of sandy character. It is typical of the Pabna sadar subdivision. Both the land and soil are suitable for aus paddy, sugarcane and *rabi* crops in general.

Season and weather.

The season was favourable for the preparation of land for *Bhadoi* sowing, but by the end of June and beginning of July there was not sufficient rainfall to take up and finish the transplantation of aman paddy. In the farm it was with great difficulty that the transplantation of aman paddy could be done. The *rabi* season was almost a failure, for want of a single shower after October, and this droughty weather continued till the end of the year affecting the *rabi* crops a great deal.

Staff.

The District Agricultural Officer, Pabna, was in direct charge of the farm and a temporary hand was provided from the month of October to supervise the works of the farm.

Babu Dinesh Chandra Das, District Agricultural Officer, Pabna, worked hard to lay out the farm.

Crops grown.

The following crops were grown in the farm during the year under review for seed propagation.

Name of the crops.	Area.	Quantity of pure seeds obtained.
1. K. B. Jute ...	... 1 Acre.	7 maunds.
2. C-Green Jute	... 1 Acre.	5 maunds 22 seers.
3. Sugarcane ...	... 0·60 acre.	25,000 cuttings.

Demonstration and tests.

1. *Aus paddies.*—The departmental aus was tried, side by side, with the local Kalabokry aus. The result which is given below, points to the superiority of Kataktara over the local one. The healthy crop of the former proved a great attraction to the people.

Result.

Name of crop	Area.	Yield per acre.
Kataktara	... 0·70	13-12-1
Kalabokry	... 0·60	12-39-0

2. *Aman paddies.*—The result of this demonstration was very marked and much in favour of the departmental variety.

Indrasail.—The result would have been much more striking had the weather been favourable. In the face of these adverse circumstances the result obtained with the Indrasail paddy is remarkable.

Result.

Name of crop.	Area.	Yield per acre. Mds. Srs.
Indrasail	0·4	16 28
Mailsira	0·2	6 28

3. *Sugarcane.*—That the tanna sugarcane is superior to the local varieties is evident from the result of the demonstration given below. This variety has been much spoken of by the local people. The demand for cuttings was very great, so much so, that all the requirements could not be met, and hence the crop will be raised on a larger area next year.

Result.

Name of crop.	Area.	Yield per acre. Mds. Srs.
Tanna sugarcane	0·10	101 0
Dhali	0·10	46 30

4. *Jute.*—In the comparison Chinsura green stands highest, R26 also a departmental varieiy comes next, and local variety Tosha stands last. The luxuriant growth of the crop and the height of the plants attracted the attention of the people. The result of the demonstration is given below.

Result.

Name of crop.	Area.	Yield per acre. Mds. Srs. Ch.
C-Green	0·4	14 29 8
R-26	0·30	12 6 12
Local Tosha	0·30	11 26 6

5. *Rabi crops.*—During the *rabi season* the following crops were grown :—

	Acre.
1. Potato (Darjeeling)	0·40
2. Pusa wheat No. 12	0·30
3. Local wheat	0·20
4. Barley	0·20
5. Oats and peas	2·30
6. Lentils	0·40
7. Khesari	0·60
8. Mustard	0·70

(*a*) *Potato* (*Darjeeling*).—The cultivation of potato is being newly introduced into the district and, in order, to demonstrate to the people the method of cultivation an area of ·4 acres was put under this crop. The crop grew will in the beginning ; but want of water and an attack of "red ants" brought down the outturn considerably.

(*b*) *Pusa wheat and local wheat.*—These crops were grown side, by side, for comparative purposes. The drought affected the crops a great deal, but inspite of the adverse conditions Pusa 12 showed its superiority over local wheat in respect of growth. As the crops were harvested, but could not be threshed in time, the results are not given in this report.

(*c*) *Oats and peas.*—A mixture crop.

(*d*) *Oats and peas.*—A mixture crop of oats and peas was grown to supply green fodder to the cattle. They were fed with the crop till the end of the year. The growth of the crop was fairly good, and a total yield of 150 maunds of green stuff was obtained.

(*e*) *Lentils.*—Local lentils were grown in an area of ·4 acres as a catch-crop ; an outturn of 5 maunds per acre was obtained ; the continual drought was responsible for the low outturn.

(*f*) *Khesari.*—It was sown broadcast in the aman paddy plots to supply green stuff for the farm cattle. The crop, when sufficiently mature, was fed to the cattle.

6. *Fruit trees and grafts.*—Some mango and lemon grafts, pine-apple suckers and coconut plants were planted during the year under report. The plants suffered very much from continued drought.

7. *Stud-bull.*—One stud-bull (a half-bred Hissar) raised on the cattle farm was obtained for this farm. The idea was to supply the public with a good bull for breeding purpose, charging a fee of annas 8 per service. The people did not appear to take any great interest, and it has been decided by the Director of Agriculture not to levy any fee in the future. Proper records will be kept about the service done by the bull.

Exhibition.

During the year under report an Agricultural and Industrial exhibition was held in the farm premises and was largely attended.

All the sections were well represented.

The Director of Agriculture, Bengal, opened the exhibition and, in a speech, explained the aims and objects of the exhibition and exhorted the organisers to hold the exhibition once in a year. It was a matter of great satisfaction that the visitors were much pleased with the exhibits and the demonstrations of the Agricultural Department.

The Secretary of the Dasuria Village Agricultural Association was awarded a silver medal for his exhibits of pure departmental seeds and fibres raised therefrom, and a certificate was awarded to a jotedar of Sirajganj for his exhibits of pure departmental seeds.

Inspection.

The Hon'ble Minister in charge of the Department visited the farm, and a meeting was convened by the District Agricultural Association on the farm premises to present him an address. The Director of Agriculture, Bengal, visited the farm thrice and the Deputy Director of Agriculture, Northern Circle, frequently, during the year under review.

Financial statement of the Pabna farm for the year 1921-22.

Assets.	Rs.	A.	P.	Rs.	A.	P.
Sale-proceeds credited to treasury ...				Nil		
Value of stock supplied and adjusted according to article 97, Civil Account Code ...				69	8	0
Value of stock in hand on 31st March 1922	2,248	14	9			
Deduct value of stock in hand on 1st April 1921	64	14	0			
				2,184	0	9
Bills outstanding on 31st March 1922 ...				Nil		
Total ...				2,253	8	9

Liabilities.	Rs.	A.	P.	Rs.	A.	P.
Establishment ...				103	3	7
Purchase of seeds, manures and implements	446	2	3			
Purchase of seeds, manures and implements by book transfer ...	242	14	6			
				689	0	9
Laying out and reclamation				880	10	3
Furniture ...				490	0	0
Office expenses and miscellaneous ...				247	7	3
Purchase and feed of cattle				940	0	0
Value of stock received and adjusted according to article 97, Civil Account Code ...				25	14	9
Value of live-stock transferred from Cattle Farm, Rangpur				150	0	0
Bills payable on account of wages of labourers for March 1922 ...				176	4	0
Total ...				3,702	7	10

APPENDIX XXII.

ANNUAL REPORT OF THE DEMONSTRATION FARM, ST. ANDREW'S COLONIAL HOMES, KALIMPONG FOR THE YEAR 1921-22.

Introductory.

(*a*) *Situation and history.*—Kalimpong is the headquarters of the subdivision of Daling (a Government estate of 401 square miles), which was ceded to the British Government after the Bhutanese War of 1864-65.

It has a fairly large bazar, and it is the mart for the produce of a considerable area, and is also the centre of Tibetan trade with Bengal.

The demonstration farm is situated, below the Kalimpong bazar, on a south-easterly slope, which runs down to the Rilli river, a tributary of the Teesta, and is 12 miles from the nearest railway station, Kalimpong road, which is on the Siliguri-Teesta Valley Extension of the Darjeeling-Himalayan Railway.

(*b*). *Area and elevation.*—The farm was started with 24 acres of land in 1907 by the Homes with the object of benefitting the local cultivators, and also training the Homes' boys both for the colonies as well as for agricultural work in India. This area has now been increased to nearly 75 acres, of which, 11 acres are occupied by roads, labourer's houses and farm buildings, with some waste lands and plots, growing trees and bamboos, leaving 64 acres for cultivation.

The elevation is as follows :—

	Feet.
Lower boundary	3,317
Farm buildings	3,673
Upper boundary	3,864

(*c*) *Irrigation.*—The only irrigation necessary for the paddy crops is obtained from the natural rainfall, and this consists of turning the water out of many streams on to the rice terraces when required. For vegetable and fruit culture during the winter and dry season irrigation is arranged through pipes from natural springs, around which "pucca" stone vats have been built. These springs are situated in the middle of the farm and give a constant supply throughout the year for the whole establishment.

(*d*) *Character of the soil.*—The soil is a rich clay-loam, the reaction being acid and it is short of lime.

Meteorology.

2. The following table gives the average rainfall for thirteen years and that of 1921 at the demonstration farm.

Months.	Average rainfall for 13 years.		1921.	
	Rainfall.	Rainy days.	Rainfall.	Rainy days.
1921.	Inches.		Inches.	
January	0·42	1	1·75	3
February	0·88	4	Nil	Nil
March	1·61	5	2·27	4
April	2·41	10	2·34	10
May	5·65	17	7·79	18
June	20·03	22	12·15	22
July	26·12	27	30·29	25
August	20·22	25	20·93	29
September	12·10	18	9·86	18
October	3·35	6	1·55	6
November	0·99	2	Nil	Nil
December	0·37	1	1·10	3
Total ...	94·15	138	90·03	138
1922.				
January	...	...	0·51	2
February	...	...	0·34	2
March	...	...	0·04	1

From the above figures, it will be noticed, that the rainfall throughout the years has been very favourable, being evenly divided for the various crops grown at the different seasons.

Operations during the years.

3. (*a*). *General crops grown.*—The following table gives the area under each crop grown by the farm, and on the half crops system, with the total outturn yield per acre, cost of cultivation, price per maund (82) lbs. and total value of crops.

Crops.	Area in acres.	Outturn in lbs.	Yield per acres in lbs.	Cost of cultivation per acre.	Price per maund.	Value of crops.	Grand Total.
				Rs. A.	Rs. A.	Rs. A. P.	Rs. A. P.
Maize	24·50	44,321	1,808	42 0	5 0	2,702 8 0	3,027 8 0
Half crop ...	9·50	5,330	560	...	5 0	325 0 0	
Paddy, (aman) ...	18·00	14,359	797	44 8	4 0	798 0 0	1,156 2 0
Paddy, straw ...	...	39,155	2,175	...	0 12	358 2 0	
Kodo (marwa) ...	10·00	15,990	1,599	62 6	4 0	762 0 0	1,104 0 0
Kodo, half crop ...	15·00	7,011	467	...	4 0	342 0 0	
Ghaiya (aus paddy) ...	1·00	912	912	47 4	5 0	55 0 0	83 14 0
Ghaiya, straw ...	...	4,756	4,756	...	0 8	28 14 0	
Buckwheat ...	1·00	389	389	22 0	5 0	23 15 0	23 15 0
Bhutmas ...	4·50	3,690	820	29 0	6 0	270 0 0	270 0 0
Soy beans ...							
Gahat	0·50	235	471	44 8	5 0	14 8 0	14 8 0
Dal, kalai ...	3·50	1,814	518	31 8	6 0	132 12 0	132 12 0
Mashyem ...	0·50	287	574	29 4	6 0	21 12 0	21 0 0
Potatoes ...	1·00	3,116	3,116	95 8	5 0	152 0 0	152 0 0
Sugarcane or *gur* ...	1·25	7,831	6,264	172 11	12 0	1,146 0 0	1,146 0 0
Arrowroot ...	0·25	208	832	280 0	61 8	156 0 0	156 0 0
Kher (thatch-grass) ..	1·50	13,940	9,292	19 0	0 2	85 0 0	85 0 0
Fruit culture ...	6·50	...	...	36 0	...	1,549 1 0	1,549 1 0
Vegetable culture ...	2·25	...	...	290 0	...	1,335 2 9	1,335 2 9

From the above figures, it is evident, that maize and Kodo (Crow's foot millet) in rotation are economically the most profitable crops for these hillsides. Kodo, Buckwheat, Soy beans and various kinds of pulses are grown after maize on the same land in one year, but none of the latter-named crops is so popular as Kodo. Ghaiya or aus paddy does well on open slopes when sown in rows. Aman paddy is also cultivated on a profitable scale and good results can always be expected if a sufficient supply of water from the *jhoras* is constantly diverted into the paddy areas till the second week of October. The other crops, such as Kalaidal, Soy beans, Mashyem and various kinds of pulses, and buckwheat, etc., give unsatisfactory results and are not encouraging. Sugarcane for the manufacture of *gur* as well as for chewing purpose, also arrowroot, fruit potatoe and vegetable culture are very profitable; and these are receiving special attention :—

(*b*) Experimental work :—

Primary :—

1. Maize.
2. Winter paddy (aman dhan).

Secondary :—

3. Autumn paddy (aus dhan).
4. Kodo (Crow's foot millet).
5. Buckwheat and wheat.
6. Soy beans and dals (pulses).
7. Sugarcane.
8. Arrowroot, cardamum, potatoes, fruit and vegetable culture.

I. *Maize* (*Zea mays*).—Since 1907-08 experiments have been carried on year after year on this farm, with a view to improving the quality of the maize and to retaining a few selected and true-to-type varieties, which are likely to give good results everywhere in the district. After many years of experiments and special attention devoted to this work, we have now on the farm six varieties, *i. e.*, yellow round, yellow flat, white round, white flat, red round, and Sutton's Giant. These six varieties have been grown on large areas, and we find the seeds are very true-to-type and heavy yielders. Special attention is paid annually to the selection of our maize for seed purpose, whereby absolute true-to-type seed is obtained.

The average outturn of maize on 11 acres of all varieties under experimental cultivation for the past eight years is given below :—

1914-15	2,539	lbs. per acres.
1915-16	2,595	Ditto.
1916-17	2,599	Ditto.
1917-18	2,367	Ditto.
1918-19	2,398	Ditto.
1919-20	2,498	Ditto.
1920-21	2,101	Ditto.
1921-22	2,439	Ditto.

The above figures speak for themselves, showing the benefits to be derived from the careful selection and preservation of seeds.

Seed was sown at the rate of 30 lbs. per acre between the third and fourth weeks of March, and manure applied at the rate of 100 maunds or 8,200 lbs. per acre. The crop was harvested from the beginning of the second week to the end of August.

(*a*) *Varieties.*—The variety experiment has given the following results for the last eight years :—

Variety experiment.

Varieties.	Outturn per acre.							
	1914.	1915.	1916.	1917.	1918.	1919.	1920.	1921.
Yellow round ... lbs.	2,767	2,757	2,388	1,886	2,214	2,449	2,070	2,275
„ flat ... „	1,804	2,378	2,490	2,132	2,419	2,736	2,275	2,367
White round ... „	3,034	2,911	2,777	3,075	2,234	2,398	2,654	2,420
„ flat ... „	2,562	1,947	3,054	3,075	2,664	2,839	2,470	2,665
Red round ... „	2,561	2,952	2,634	2,542	2,542	2,777	1,783	2,183
Sutton's Giant ... „	...	...	881	1,250	1,640	2,060	1,906	2,420

These figures are from one acre blocks, and the figures backed up by the average from the farm require no comment.

The yellow round variety of maize is extensively cultivated, and is a great favourite, being most profitable and popular with cultivators, and merchants. The white round is another favourite and both these two varieties are made into maize meal and eaten as porridge by the hill-people as well as by Europeans.

The red round is not cultivated much, although, we find it one of our best yielders. There seems to be no market for it, and it is chiefly given to poultry and animals. The white and yellow flat varieties are very well-known by the hill-people to be heavy yielders, but as they get mildewed very easily, only a few raiyats cultivate them in order to sell the crop soon after harvesting. The thin ends of the cob are usually open, and are, therefore, very accessible to weevils. Sutton's Giant maize "white flat" is also cultivated on this farm, and has the same drawbacks as the two last named varieties. The present demand for this seed is great.

(II) *Effect of terracing.*—To compare the results of growing ordinary crops (not irrigated paddy) on terraced and unterraced land, 2 acres were selected as uniform in fertility and slope as was possible to find on the farm, each plot receiving similar treatment, equal amounts of manure and seeds being applied.

The following table shows the outturn and cost of cultivation of maize and secondary crops for the last eight years :—

Terraced crops.	Per acre.		Crops.	Per acre.	
	Outturn.	Cost of cultivation.		Unterraced outturn.	Cost of cultivation.
1914-15.	lbs.	Rs. A.	1914-15.	lbs.	Rs. A.
Maize	2,526	37 9	Maize	2,933	38 1
Buckwheat ...	358	14 9	Buckwheat, local ...	369	1 9
1915-16.			1915-16.		
Maize	2,829	33 5	Maize	3,308	33 8
Soy beans, Barmah ...	410	22 8	Soy beans ...	287	22 0
1916-17.			1916-17.		
Maize	2,675	36 0	Maize	2,798	36 8
Kodo grains ..	1,886	46 0	Kodo grains ...	1,732	46 0
Straw estimated at Rs. 5 per acre.			Straw estimated at Rs. 5 per acre.		
1917-18.			1917-18.		
Maize	2,747	38 0	Maize	2,644	38 0
Dal kalai, grains ...	481	23 0	Dal kalai grains ...	502	23 0
Do., straw ...	984		Do. straw ...	1,025	
1918-19.			1918-19.		
Maize	2,644	36 4	Maize	2,419	36 0
Buckwheat, local ...	307	15 4	Buckwheat, local ...	317	15 0
1919-20.			1919-20.		
Maize	2,900	38 0	Maize	2,593	38 0
Soy beans, Barmah ...	381	26 0	Soy beans ...	410	26 0
1920-21.			1920-21.		
Maize	2,716	41 10	Maize	2,385	41 6
Kodo grains ...	1,855	57 2	Kodo grains ...	1,998	57 2
Straw estimated at Rs 5 per acre			Straw estimated at Rs. 5 per acre.		
1921-22.			1921-22.		
Maize	2,695	42 0	Maize	2,439	42 0
Dal kalai grains ...	574	31 8	Dal kalai grains ...	471	31 8
Do., straw ...	1,312		Do. Straw ...	984	

After eleven years of experiments on these two acres, we find that during these past five years the terraced area has shown a marked improvement over the unterraced in the main crops, the average yield of maize being 2,740 against 2,498 lbs. or three maunds, while, it will be seen, that the secondary crop has done better on the unterraced area except for this year.

III. Manurial experiments.—Three plots of ½ acre each have been reserved for these experiments since 1910-11. The conditions of the soil in each plot is fairly uniform and the situation of each plot is approximately at the same level. For the past 11 years this manurial experiment has been continued, and yearly the half acre with superphosphate plus farm-yard manure has given the best results of the three.

It was, therefore, decided to give up applying all manures on these areas and to work these three half acres as unmanured areas for three or four years to find out the residual effects. This latter experiment was kept up for four years, but, as the results became more unsatisfactory each year, it has been decided to discontinue the experiment in future

Ordinary mule manure, which we purchase at Rs. 2-8-6 per ton, is the most economical and effective, and this manure is chiefly utilized on the farm as well as by the surrounding cultivators.

2. *Paddy.—Transplanted paddy—Amana dhan.*—Owing to the proximity of this farm to the hill ridge there is no catchment for water, and crop in consequence is almost entirely dependent on the incidence of rainfall during the months of its growth.

The seed beds are sown by the third week in May, and transplanting commences by the end of June, and is completed by the end of July. The harvesting takes place soon after the first week of November and continues to the end of the month.

During the year under report three different kinds of experiments have been conducted with paddy, viz., (*a*) elevation, (*b*) variety and (*c*) manurial.

(*a*) *Elevation.*—This experiment with the Touli variety of paddy has been undertaken since 1915-16, in order to indicate at what altitude paddy would do best on the farm and the surrounding hillsides.

Elevation experiment.

Serial No.	Area in acres.	Approximate elevation.	Variety.	Yield per acre.	Cost of cultivation.
		Feet.		Grain straw.	Rs. A.
1	5·75	3,317—3,550	Touli ...	1,406—2,624	283 4
2	3·00	3.550—3,650	Do. ...	922—2,747	148 8
3	2·33	3,500—3,700	Do. ...	722—2,472	123 0

During the past seven years of this experiment it has been proved that the lower elevation area has yielded the best results.

(*b*) *Variety test.*—The following table shows the figures obtained for the last four years in connection with this experiment.

Variety experiment.

Variety.	1918-19.		1919-20.		1921-22		1921-22.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Touli	1,436	2,952	1,394	3,583	738	1,968	710	1,778
Danase	1,066	2,542	1,271	4,346	697	2,378	538	2,060
Mansara	1,599	3,034	1,681	3,280	697	1,804	621	1,658
Ratomarshi	1,558	2,870	1,763	2,321	1,076	2,460	944	1,792
Timburay	1,312	2,706	1,804	4,018	410	1,640	328	1,414
Ramtulshi	1,271	2,624	1,353	3,034	451	1,763	408	1,528

From the above figures, it is difficult to judge, which is the best yielder; although Ratomarshi seems to have yielded the best results. Some varieties require plenty of irrigation and ripen earlier, while others do not, and when the rainfall is heavy or light, as the case may be, the varieties either suffer or give good outturns. On the whole, Touli seems to be slightly the best and has many advantages, and this variety is cultivated chiefly on the farm.

(*c*) *Manurial tests.*—During the past 12 years an experiment has been conducted to note the effects of green manuring, as compared with farm-yard manure, and an unmanured plot with the Touli variety of paddy.

The results of the last three years are here recorded :—

Manurial experiment.

Manure.	Outturn per acre.					
	1919-20.		1920-21.		1921-22.	
	Grain.	Straw.	Grain.	Straw.	Grain.	Straw.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1. Unmanured	1,260	3,013	526	2,732	649	2,671
2. 4,100 lbs. farm-yard manure	768	3,597	309	2,173	806	2,515
3. Green manured (Soy beans)	1,383	3,259	557	1,968	1,180	2,609

From these figures there does not appear to be any advantage from farm-yard manuring. Unmanured and green-manured areas have always given better results. It is never the practice to manure paddy areas on these hillsides, as the washings, etc., from above reach the fields from the "*jhoras.*"

(*3*) *Aus dhan* (or *Ghaiya*)—*Unirrigated paddy.*—This crop is usually sown broad cast on slopes thoroughly exposed to wind, air and well-drained. On the farm it has always been sown in rows of 18 inches and seeds dibbled in at 8 inches apart, but this year ½ acre plots lying, side by side, were cultivated with this crop to test the yields of the drill and broad cast system of sowings and the following are the results :—

Drill.		Broad cast.	
Drill 18″ × 8″ Yield in lbs. per acre.	Cost of cultivation per acre.	Broad cast yield in lbs. per acre.	Cost of cultivation per acre.
	Rs. a.		Rs. a.
1,086 G. 5,330 S.	48 8	738 G. 4,141 S.	50 8

The drill system has given the best results of the two, and we find the cost of cultivation in the broad cast area has been more, this due to the difficulty experienced in hoeing and weeding in amongst the crop.

(*4*) *Eleusine Coracana*—*Marwa Kodo.*—This crop grows in rotation with maize, and is transplanted from the third week in June to the end of July, so that, when the maize is harvested in August the Kodo covers the land having well developed in the intervals.

The following table shows the average outturn per acre from 1914 to 1921 from 6 acres of land under marwa cultivated by the farm :—

Marwa outturn for 8 years.

	lbs.
1914	1,886
1915	1,909
1916	1,640
1917	1,790
1918	2,099
1919	1,865
1920	1,980
1921	1,947

During the past 7 years an experiment has been conducted to test the yield of two varieties, the curly closed and the open loose headed types. Both these varieties of marwa are cultivated extensively on these hills, and the results obtained are as follows :—

Marwa variety experiment.

Year.	Variety.	Areas in acres.	Outturn.	Cost of cultivation.	Value of crops.
			lbs.	Rs. A. P.	Rs. A. P.
1915-16 ...	Curly closed	1	1,763	43 8 0	80 4 0
	Open loose	1	1,906	47 0 0	86 6 0
1916-17 ...	Curly closed	1	1,804	45 0 0	65 8 0
	Open loose	1	1,937	47 8 0	70 0 0
1917-18 ...	Curly closed	1	1,829	48 8 0	56 9 0
	Open loose	1	1,908	49 0 0	60 0 0
1918-19 ...	Curly closed	1	1,905	49 0 0	80 9 0
	Open loose	1	2,009	49 8 0	84 10 0
1919-20 ...	Curly closed	1	1,814	60 2 0	115 10 0
	Open loose	1	1,916	60 2 0	121 14 0
1920-21 ...	Curly closed	1	1,998	57 6 0	91 6 6
	Open loose	1	1,962	57 6 0	89 12 3
1921-22 ...	Curly closed	1	1,855	62 0 0	106 13 0
	Open loose	1	2,039	62 12 0	116 15 0

The open loose variety seems to be the best yielder of the two, averaging 100 lbs more per acre, in spite of its shedding a good deal of its grain at the time of harvesting.

The straw is estimated at Rs. 5 per acre, and this is used for grazing. The grain was sold this year at Rs. 4 per maund late in March 1922.

Special selection work is now being conducted with the help and guidance of Mr. Hector, Economic Botanist, Bengal. The cultivation of these selected lines is being carried out carefully in the manner laid down by him.

(5) *Buckwheat—Fagopyrum Esculentum—Phaper.*—This is grown in rotation after maize. Seed in sown in the beginning of September and is ready for harvesting by the end of November. One acre was sown with this crop in rotation after aus paddy and an outturn of 389 lbs. was obtained at a cost of Rs. 22. This crop more or less every year proves a failure, due to drought at the time the crop comes into full blossom. As the crop takes 2½ months only to mature, it requires two or three showers of rain during the interval ; failing this, the crop invariably gives no successful results.

(6). *Leguminous Crops.*—

(A). *Soybeans—Glysine hispida—Bhatmas*:—The following varieties were grown on the farm on one acre plot, and figures for the past 8 years are given below: —

Variety.	Yield per acre of grain.			
	1914-15.	1915-16.	1916-17.	1917-18.
	lbs.	lbs.	lbs.	lbs.
Neyali	1,681	820	1,148	902
Barmali ...	967	410	861	543
White	...	...	...	...
Green	729	164	922	410
Chocolate	709	635	820	656
Black	676	440	984	797

Variety.	Area in Acres.	1918-19.	1919-20.	1920-21.	1921-22.	Remarks.
		lbs.	lbs.	lbs.	lbs.	
Nepali ...	1	1,148	1,517	1,025	861	Whole season crop grows alone.
Barmali ...	1	430	396	86	912	
White ...	1	463	349	34	451	
Green ...	1	313	272	33	963	Grows in rotation with maize.
Chocolate ...	1	522	615	502	1,086	
Black ...	1	635	410	375	481	

The first three varieties are erect growing, while the last three mentioned are of trailing habits.

All these six varieties of Soybeans can be grown in rotation with maize however, Nepali Bhatmas grows very little when grown along with maize, but when grown alone on an open slope yields heavily. The crop cannot, however, compete with maize or marwa for profit. The cost of cultivation of these crops was Rs. 29 per acre, except the Nepali variety which, when grown alone, cost Rs. 45 per acre. The value of the Nepali Soybeans was Rs. 8 per maund (82 lbs.) and of the other varieties at Rs. 6 per maund.

(B). *Kalai dal—Phaseolus Mungo.*—An area of 1·50 acres was cultivated with three varieties of this dal and an outturn of 518 lbs. per acre was obtained. There is a great market for this dal and the price usually varies from Rs. 6 to Rs. 8 per maund. The cultivators usually sow this crop as well as Soybeans on the ridges or ails of paddy fields.

(C). *Phaseolus—Calcaratus—Mashyam Dal.*—Four varieties of this local dal was cultivated on a half acre plot yielding 574 lbs. of grains at a cost of Rs. 29-4 per acre. This crop produces heavy foliage and is being recommended as a green manure for various crops in the district.

(D). *Dolichs Biflorus—Gahat.*—An area of half acre was cultivated with this crop in rotation with maize, and an outturn of 471 lbs. at a cost of Rs. 29 per acre was obtained. This grain is largely used by the hill people for medicinal purpose.

(7) *Sugarcane*—(Ukhu).—This crop takes 18 months to come to maturity on these hills as compared with 10 months on the plains. In April 1916 a terraced area of 0·50 was planted with this crop, and since then has been increased to 1·25 acres. An outturn of 7,831 lbs. or 6,264 lbs. per acre of Gur was manufactured at a cost of Rs. 215-14 and this was sold at Rs. 12 per maund. A clear profit of Rs. 744 per acre is obtained after paying all expenses. The cultivation of Sugercane seems to be the most profitable crop on the hills, either for manufacture of Gur or for chewing purpose, as the crop grows with great success when ratooned, consequently the cultivation expenses are less. A local light yellow variety of Sugarcane has been tried on a small scale since last year to test the difference in yields of the two present varieties, which are called Kalo Gyaurah Ukhu (similar to red mauritius) and Saito-Gyaurah Ukhu which is like the Bengali Shamshara.

The light yellow variety was not used for Gur manufacture this year under report, as the crop had not thoroughly developed. The few good canes we did harvest has been used for seed purpose to increase the area. Apart from the above area under the present red variety, we hope to have this next year under the light yellow variety an area of about half an acre, which will enable the farm to be in a position to have a Gur-making test of the two distinct varieties.

(8) (*a*) *Potatoes— Alu.*—Four plots of ¼ acre each was planted out with two varieties, *i.e.*, red and white round tubers, as a variety experiment and also to test the ridge method or against local method of dibbling on the flat. The following results have been obtained :—

Variety.	Area in acres.	Method of cultivation.	Outturn per acre in lbs.	Cost of cultivation per acre.	Value of crops.
				Rs.	Rs. A.
White round ...	¼	Ridge and furrow ...	3,034	90	185 0
Ditto ...	¼	Dibbled	2,665	98	162 8
Red round ...	¼	Ridge and furrow ...	3,239	94	197 8
Ditto ...	¼	Dibbled	3,526	100	215 0

The red round variety yielded the best results in both the experiments and the only thing objection to the broad-cast dibbled in method, is the cost of cultivation which seems a bit more expensive. This red round variety was a great demand in all the markets and fetches a higher price being much appreciated by the Indians for its flavour and its higher yielding capacity.

Seedling Potatoes.—Nine ordinary packets of Ryder's Hybrid Potatoe seeds were sown in seed boxes and 26 young seedlings survived. These were transplanted out in open beds on the 27th December 1920, and gave an outturn of 618 large and small tubers weighing 2 lbs. 10 ozs. 7 drams which was harvested gradually from the 25th March to the end of May 1921. This first generation's outturn was carefully stored away after every individual tuber had been thoroughly examined and its description recorded. The second generation was planted on the 19th October 1921, and out of the 618 tubers harvested from the first generation crop, 446 tubers which remained good after monthly rejections were planted. This crop was harvested on the 28th February 1922 with an outturn of 1,729 tubers weighing 53 lbs. 11 drams. So far two seedlings, Nos. 14 and 22K, promise to give the best results. After the third generation, we shall be in a position to

retain the best yielders for cultivation on a larger scale for seed-supply and reject the doubtful varieties.

From Comilla and Dacca a few tubers were sent to us for propagation purpose after they had been reared from seed as first generation crop; these were stored throughout the rains and a few rotted and dried which had to be rejected. The remaining tubers were planted out carefully and a fair result has been obtained. A seedling has also been raised from Rajshahi.

This is a new and important branch of work and is receiving our special attention as there is much scope for improvement in this crop.

(*b*) *Arrowroot—Maranta Arundinacea.*—An area of ·25 acre was planted with this crop in April 1921 and the tubers were harvested in January and February 1922. Arrowroot was manufactured during these months, and a return of 208 lbs. or 832 lbs. was obtained at a cost of Rs. 280-8 per acre while the value of the crop was Rs. 156 or Rs. 624 per acre. This is a very profitable crop, and it is being introduced amongst the cultivators very gradually.

(*c*) *Fruit culture.*—For this section of our work we have set aside an area of 6·50 acres (of which 3·02 acres is under the Darjeeling Improvement Fund, for supply of graftings, cuttings, etc., to the cultivators in the district free of cost). It is being cultivated with various kinds of fruit trees. English fruit trees were tried, but with no success, due to the fact that our elevation is rather low and has a southern aspect. Careful experimental work has been taken in hand, to improve the quality, flavour and size of the local orange. The trees can be brought to full bearing within 5 or 6 years by budding on sour limes, etc., instead of the local practice of growing from seed and "gooting."

(*d*) *Pineapples.*—An experimental area of half an acre under pineapples of the queen variety was cultivated from 1912-13 till 1919-20, and as we had already received definite figures, which proved it to be a very profitable crop, this half acre was eventually uprooted during last year as the area became very poor in plant food and the crop congested. This crop has been planted out amongst the fruit trees in the two orchards to keep up the supply of suckers.

From sale of fruits and fruit trees, including pineapple suckers from the farm nursery, a sum of Rs. 1,549-1 was realized at a cost of Rs. 267 giving us a substantial profit of Rs. 1,282-1.

(*e*) *Vegetable culture.*—During the year under report 2·25 acres were placed under vegetables, and practically all varieties of foreign and Indian vegetable were cultivated in their respective seasons. Every thing has been grown with more or less success, and a sum of Rs. 1,335-2-9 was received from the sale of these vegetables. The cultivation expenses including the price of seeds and cost of manure applied for the 2·25 acres was Rs. 652-8.

Our chief market has been Kalimpong, although a large quantity of various kinds of vegetables were sent to the Teesta Bridge Bazar in the winter months.

Our main object in taking up this class of cultivation on the farm is to introduce it amongst the raiyats of the Government estate, and make it the centre for rearing seedlings for issue to the local cultivators, and to put them in the way of exporting their produce to Calcutta at suitable times, as well as to provide for the needs of the coming hill station.

(*f*) *Cardamum—Amomum Sublatum—Thulo Alaichi.*—An area of about ·25 acre has been planted out with two variaties of cardamum this past year and so far no fruits have been harvested, although the crop has blossomed very freely since March. It may be noted here that cardamum is grown extensively on these hills in the shady and wet corners and close to jhoras or springs for its irrigation, as it is one of the most essential thing cardamum requires for its growth. The sale price of cardamum has been low these past few years, so has the returns decreased a great deal, consequently we have taken up an investigation. Further report on this crop will be recorded next year.

(*g*) *Wheat—Triticum Vulgare—Gehun.*—An area of ·75 acres was sown with a red hard variety of wheat (procured from the Rajshahi Farm), in rotation after paddy early in the month of December 1921. The crop had to be irrigated at a nominal cost on two occasions to enable the seeds to germinate and develop. At the end of March 1922 the crop looked very promising and the best we have even managed to grow since the establishment of this farm. No figures can be given as the crop has not been harvested.

Distribution of Seeds.

4. The following lists of seeds, etc., were distributed during the year 1921-22 :—

Maize	3,750	lbs.
Paddy	115	„
Marwa	63	„
Soybeans	499	„
Mashyam	182	„
Buckwheat	38	„
Wheat	266	„
Dal Kalai	264	„
Gahat	15	„
Potatoes	540	„
Sugarcane rooted cuttings	3,327	
Arrowroot tubers	16	lbs.

Vegetable—

Cabbage seedlings	...	...	3,550
Cauliflower ,,	...	...	2,960
Ditto seeds	...	...	4 lbs. 140 ozs.
Knol Khol seedlings	...	...	670
Celery ,,	...	...	3,220
Tomatoe ,,	...	...	37
Sikkim Pea seeds	...	...	16½ lbs.
Beans ...	...	...	21 ,,

Fruit trees—

Orange Seedlings and Gooties	...	...	209
Lime and Lemons	...	...	15
Pears ...	...	...	138
Peaches ...	...	...	38
Plums ...	...	...	16
Plantain ..	...	...	65
Papayas ...	...	...	131
Grenadilas ...	...	...	68
Pineapple suckers	...	...	4,380
Guavas ...	...	...	389
Gooseberries ...	...	...	36
Raspberries ...	...	...	18
Figs ...	...	...	12
Grapes ...	...	...	10

The above list of fruit trees also includes the number supplied from the Darjeeling Improvement Fund's Nursery which is situated in the heart of the farm.

Miscellaneous.

5. (*1*) *Cattle.*—There are six pairs of draught bullocks kept on the farm, and the health of the animals have been very satisfactory. A large number of cultivators within a radius of 2 miles of the farm depend on our cattle to plough their fields for sowing their maize and paddy crops, and a sum of Rs. 83-11 was realized as plough hire during the year.

(*2*) *Poultry.*—Half an acre of land has been set aside for poultry rearing, and in this area five substantial houses have been erected with long wire-netted runs, and fruit trees planted in rows in these runs, to serve the purpose of giving shade for the birds. In the five houses the following strains of birds are kept :—

(*i*) Pure white Wyandotte Cocks with white Sikkim hens. Object.—To obtain a hardy and good laying strains of birds suited to the hills.

(*ii*) Buff Orpingtons. Object.—To see how they would thrive up here and whether commercially they will be beneficial to the public.

(*iii*) White Orpingtons. Object.—Same as above.

(*iv*) White Wyandottes. Object.—Same as above.

(*v*) Mixed strains of local, Sikkim and Chittagong birds are kept for the supply of broody hens, as these birds make the best mother.

For the time being it is intended to work without an incubator, consequently we are forced to keep the birds of No. 5 house for this purpose.

A sum of Rs. 170-14-6 was realized from sale of poultry and eggs and the expenses incurred in this respect amounted to Rs. 111-4-6 during the year under report.

Altogether 42 dozen of eggs were sold of both white Wyandottes and Buff Orpingtons and 47 chickens of over six months old of the above strains were also supplied for breeding purposes. No less than 95 healthy chickens have been reared this past year with success and these we hope to distribute all over the district. Cholera, small-pox and roup broke out again this year, but timely attendance and treatment saved most of the birds from destruction.

(*3*) *Practical Training.*—Lectures and practical demonstrations are given at various seasons of the year to the cultivators living within a radius of 5 miles of the farm, also to the boys and masters of the Normal school, in connection with the selection and preservation of maize seeds, manufacture of Gur and arrowroot, fruit and vegetable culture, and instructions on entomology and mycology.

In addition, three boys from the Chittagong Hill Tracts were trained in the practical agriculture, especially the construction of terraces, up to the end of December 1921. Also two local educated hill men have been trained to work as agricultural Sub-Overseer for introduction of agricultural improvements in the Khasmahals of the Kalimpong Sub-division.

Demonstration Work.

The work started during 1920-21 in the four Demonstration Centres in the Kalimpong Sub-division have been continued this year under report, and satisfactory practical results have been accomplished with general agricultural crops, fruit and vegetables the conservation of farm yard manure in covered pits, etc. A separate report on this work has been submitted.

Visits and Inspections.

6. The Hon'ble Nawab Saiyed Nawab Ali Chowdhury, Khan Bahadur, C.I.E., Minister for Agriculture and Industries, Bengal, visited the farm in November 1921, Mr. G. Evans, C.I.E., Director of Agriculture, Bengal, inspected the farm on several occassions. Mr. Hector, Economic Botanist and Mr. Carbery, Agricultural Chemist, paid several inspection visits. Mr. F. Smith and Mr. J. N. Sarkar, Deputy Directors of Agriculture, also inspected the farm during the year under report.

Establishment and management.

7. I was the Manager-in-charge during the year. The land for the farm was bought by the St. Andrew's Colonial Homes, and is subject to an annual rental of Rs. 83-12. The farm is managed by the Homes and the Bengal Agricultural Department's grant of Rs. 5,000 plus half sale proceeds is now barely sufficient to meet the working expenses and the up-keep of the farm. The remainder of the sale proceeds is credited to the Homes.

The programme of work for this farm is drawn up with the help and sanction of the Bengal Ag ric ulture Department.

Receipts and expenditure.

A copy of the balance sheet for the year ending 31st March 1922 is given below :—

Receipts.	Rs.	A.	P.
Balance in hand from 1920-21 ...	1	1	6
Government grant 1921-22 ...	5,000	0	0
Sale of Farm Produce ...	9,971	7	6
Miscellaneous	953	13	9
Loan from Homes for working expenses	2,275	0	0
Total ...	18,201	6	9

Expenditure.	Rs.	A.	P.	Rs.	A.	P.
Labour ...	6,164	0	9	...		
Superintendence	2,855	10	0	9,020	3	9
Miscellaneous—Seeds ... Manures, repairs, etc. ...				2,081	5	6
Half crop to Homes ...				4,985	11	9
Insurance policy of renewal ...				31	10	0
Loan repaid				2,082	0	0
Balance in hand				0	7	9
Total ...				18,201	6	9

The total value of produce sold shows an increase of Rs. 898-9-9 as compared with that of last year. This is chiefly due to the good returns in the various crops received this year and a small increase realised in the sale prices of maize and marwa seeds.

A sum of Rs. 3,113 is due to the Homes on account of money borrowed during 1920-21 and 1921-22 for meeting the enhanced working expenses of the farm. A similar sum we are afraid will have to be procured from somewhere, to enable this farm's work to progress satisfactorily ; as the annual grant from Government of Rs. 5,000 plus the half sale proceeds are not sufficient to meet the growing expenses involved these past two or three years.

We are again indebted to Mr. H. F. Green, Manager, Government Cinchona Plantation, Monsong, for his kindness in valuing the farm stock, as at 31st March 1921 it was Rs. 2,229 as compared with 31st March 1922, Rs. 2,356-8.

Henry R. Edmunds,

Superintendent of Agriculture, Darjeeling.
In charge Kalimpong Farm.

APPENDIX XXIII.

REPORT OF THE SUPERINTENDENT OF AGRICULTURE ON SPECIAL DUTY, AGRICULTURE EDUCATION, 1921-22.

During the year 1921-22, there were two Middle Vernacular Agricultural schools in the Province, one at Dacca and the other at Chinsura. The object of these schools was to train the sons of cultivators in the elements of agriculture without divorcing them from the normal courses of study in Vernacular, Mathematics, History, Geography, etc., up to the Middle Vernacular standard. There were 27 students in the roll of the Dacca school and 12 in that of the Chinsura. All of them were granted stipends and at the final examinations the students showed good progress.

At the later part of the year, however, it was decided to convert both these schools into Secondary Agricultural schools and the ordinary cultural subjects were stopped. The new curriculum included Agriculture, Rural Engineering including carpentry, smithy, surveying, construction and maintenance of simple roads, buildings, fences, drains, etc., Veterinary Hygiene, Book-keeping, and Rural economics including zamindary accounts and co-operation. The object of the school is now to train a type of practical and self-reliant agriculturists who would with advantage go in for independent farming or get employed as an Agricultural Demonstrator under the Government, Court of Wards, khas mahal or private estates. There are altogether 64 boys in the two schools of whom 52 are holders of Government stipends. The District Boards of Mymensingh and Dacca have granted two stipends.

The boys have to learn the work mostly practically and theoretical lessons are also given.

It has also been decided to open a number of elementary agricultural schools in rural areas and a carefal selection of places has been made. It is expected to open 20 now as an experimental measure.

N. GUPTA,

Superintendent of Agriculture on special duty, Agriculture Education.

APPENDIX XXIV.

ANNUAL REPORT ON THE SERICULTURAL OPERATIONS IN BENGAL FOR THE YEAR 1921-22.

The programme of sericultural operations during the year under review was continued as in the preceding year. This year witnessed many changes both in the personnel as well as in the working of the Department.

Official changes.

Rai Sahib A. C. Ghose, Superintendent of Sericulture, Bengal, who temporarily held the post of Deputy Director of Sericulture, Bengal, from 1st April till he was relieved by me on the 3rd June 1921, was succeeded by Babu S. N. Bose as first Superintendent of Seri. culture, Bengal, in April 1921. Maulvi Shaikh Abdullah, B. Sc., succeeded me as second Superintendent of Sericulture, Bengal, and joined this Department in January 1922

Rai Sahib A. C. Ghose spent 33 days on tour whilst I spent 134 days in the inspection of nurseries and rearing villages and as usual conducted research operations in addition to the general duties of the post.

Changes in policy and working of the Department.

The question of organising the Department on practical, representative and up to date lines in response to the demand of the rearing population and the various sections of people engaged in the industry having become obvious, the Director of Agriculture, Bengal, held an informal discussion last May with the Imperial Protozoologist and myself. It was decided to formulate a practical scheme so that the rearers could be taught to rear their own seeds under departmental supervision and thus establish the industry on a more permanent basis.

I also made a tour in several rearing villages of Murshidabad and Malda to discuss these proposals with the reerers on the spot and obtained the opinion of more than one hundred influential reerers in various centrns, viz., ten rearing villages in Malda and fourteen rearing villages of Murshidabad. The general opinion of the rearers appeared to favour the policy of utilising the nurseries as training grounds for instruction in methods of producing healthy seeds instead of concentrating the departmental activities chiefly towards the production of disease-free seeds for sale. They agreed that it was more desirable that the stock seeds should be reared at the Government nurseries under ideal conditions and then sold to the professional seed-growers for further propagation. The crop produced by the seed-growers from the seed of the orginal Government stock should be sold as seed to the cocoon-growers who constitute the bulk of the rearing population. Work on the above lines has already been organised by the introduction of a class of seed-growers working under Government supervision. The results obtained so far have been encouraging and seem to indicate that seed of good quality can be turned out by the rearers at a much less cost for supervision than in the Government nurseries.

A conference of leading and influential persons representing all shades of opinion, both official and non-official, having either an administrative or commercial and patriotic interest in the subject was held at Calcutta on the 7th March 1922 under the presidency of the Hon'ble Minister of Agriculture and Industries to consider questions relating to the present position and future policy of the Sericultural Department. It is hoped that the decisions arrived at during this conference, will be of material assistance in reviving this important and time-honoured Indian industry.

Government nurseries.

There are seven Government nurseries :—

Berhampur	Central nursery	...	Murshidabad district.
Kumarpur	ditto	...	
Chandanpur	ditto	...	
Piasbari	ditto	...	Malda ,,
Amriti	ditto	...	
Mirganj	ditto	...	Rajshahi ,,
Kalitha	ditto	...	Birbhum ,,

The total area under mulberry cultivation is 370 bighas. The Berhampur Central Nursery was extended by 80 bighas last year, and it is hoped that the whole area will be brought under cultivation by next October. This would bring up the total area under cultivation to 450 bighas. However, as this will also necessitate an increase in staff, it has been proposed to meet the present requirements by the abolition of one or two smaller nurseries so as to concentrate work and thus save the extra cost of supervision. The Berhampur Central Nursery was formerly reserved for research operation, but it is hoped that from next year the major portion of this nursery will now be available for seed supply work according to the general programme along with other six nurseries.

Sale of microscopically examined and selected Nistari and Chhotopolu seed to the rearers.

The total receipts from the nurseries from 1st April 1921 to 31st March 1922 were as follows :—

	Rs.	A.	P.
From 20,395 K. seed cocoons	76,927	11	3
„ 975 K. cocoons	1,197	2	0
„ miscellaneous production	1,256	12	3
Total ...	79,381	9	6

The details of sale proceeds of the outturn of each central nursery during 1921-22 are given below :—

Name of nurseries.	Seed.	Cocoons.	Miscellaneous.	Total sale proceeds.
	K.	K.	Rs. A. P.	Rs. A. P.
Piasbari	6,418	129	242 5 0	26,553 9 9
Amriti	4,935	130	280 12 0	21,987 9 9
Mirganj	2,461	18	62 2 0	10,013 15 9
Kumarpur	3,083	273	117 12 0	10,118 3 0
Chandanpur	1,176	140	148 10 0	3,783 12 6
Kalitha	2,322	259	69 10 9	6,541 10 3
Dacca Farm	...	26	...	47 4 0
Berhampur Company Bagan ...	...	...	76 10 0	76 10 0
Malda Sulphur Godown ...	...	...	258 14 6	258 14 6
Total ...	20,395	975	1,256 12 3	79,381 9 6

The total expenditure on the nurseries, including the office establishment from 1st April 1921 to 31st March 1922 is as follows :—

Details.	Amount. Rs.	A.	P.
Salary of Deputy Director of Sericulture, Bengal ...	5,514	0	0
„ 1st Superintendent „ „ ...	3,110	0	0
„ 2nd „ „ „ ...	382	4	1
Pay of establishment	32,076	11	5
Travelling allowance of Gazetted Officers	5,153	5	6
„ „ of establishment	7,835	7	0
Petty construction and repairs	5,792	14	3
Rewards to Nurserymen and Sericultural students ...	710	0	0
Disinfection	4,925	11	9
Cultivation and rearing	81,963	4	6
Miscellaneous	12,497	15	8
Rent, rates and taxes	2,498	15	9
Total ...	1,62,460	9	11

Improvement of the Sericultural Establishment.

To effect proper organisation it is necessary that the department should be brought on a permanent footing. At present it is temporary and as such offers very little attraction to the staff to remain on permanently. In order to remove this difficulty a re-organisation scheme has been submitted on the lines of the Agricultural Department and is at present under consideration of Government.

Sericultural Schools.

The principles of scientific sericulture were taught to professional rearers' sons at the Rajshahi and Berhampur Sericultural schools. Elementary lessons in scientific sericulture are also imparted to the boys of the Piasbari and Amriti Primary schools.

During the year under report three ex-students of Rajshahi Sericultural school were paid the first instalment of rewards for the construction of model rearing houses. Owing to the rise in the prices of materials it has been difficult for these ex-students to construct a model rearing house according to the prescribed plan of the Department within the sanctioned reward of Rs. 250 only. It is now under consideration to raise this amount to Rs. 500 and to extend the period of agreement to 10 years in lieu of 5 years as at present.

The work of the ex-students in Malda is being supervised by a Sericultural Inspector. This post was sanctioned for Malda last year and signs of progress are already evident in that several ex-students have taken up seed-growing as their special vocation. To properly organise this work more officers will be necessary in future as it is not possible for one officer to look after the work of the students in several districts. It is highly desirable that the ex-students of Sericultural schools should be persuaded to work as "selected rearers" so as to serve as intermediate agencies for seed supply. They have better rearing accommodation and at the same time have been trained to rear according to improved and sanitary principles.

Demonstration.

During the year under review several demonstrations were arranged in rearing villages in Bogra, Birbhum and Bankura in addition to such work in Malda, Murshidabad and Rajshahi. This work is being appreciated by the rearers. It is quite apparent that any demonstration to be useful must be arranged with due reference to local needs and such an organisation would naturally imply the deputation of a set of trained officers exclusively for demonstration and propaganda work in the villages.

At Bogra, the local market having declined, and the price of cocoons gone as low as As. 5 per kahan against the current rate of Re. 1-8 to Rs. 2 per kahan, in Malda the rearers had been compelled to give up their profession of silkworm rearing. Since the starting of demonstration work, however, and owing to the help given to the people by the Department in providing mulberry cuttings and also on account of the improvement of their stack by microscopic examination, the area under mulberry in the villages of Gandagram, Asakpur and Chakjhora of this district has been extended since September last from 6 bighas to 22 bighas by the rearers themselves at their own cost. Many rearers who had given up this work have approached me for mulberry cuttings and it is hoped if arrangements for cuttings can be made that the area will increase to 50 or even 100 bighas, in the course of a year or two. The rearers of Bogra are now selling their produce to Malda and Murshidabad rearers at prices ranging from Rs. 3 to Rs. 4 per kahan when sold as seeds and the price of cocoons have also gone up owing to the creation of a demand in Malda by proper advertisement.

Through the initiative of Mr. G. S. Dutt, Collector of Bankura, demonstration work has been arranged and started by this Department with the village of Punisole as centre and seeds are being provided to the rearers. Two local boys have been admitted to the Sericultural class at Berhampur and it is expected that after passing the school final examination they will be able to start work on their own account and to supply good seeds to these villages under Government supervision. Their example will at the same time serve to popularise improved methods in this locality. A special noteworthy and distinct feature in connection with the silk industry in Bankura is that the rearers reel their own cocoons and sell the yarn locally to the neighbouring weavers of Bishnupur being altogether independent of an outside market. At present a considerable quantity of silk is being purchased from Malda by these weavers. If the condition of rearing and reeling could be improved there is every reason to hope that the district will in a short time be entirely self-supporting.

As in the district of Bankura, considerable work might be done at Midnapore as this was also a noted centre in the past. It would be useful to undertake the improvement of the industry in this district also by starting demonstration work.

The district of Birbhum as a speciality in that one of the principal varieties of indigenous mulberry silkworm is being reared there. We have a nursery in that locality but the work hitherto done there was mostly confined to the general programme of the rearing of Nistari and Chhotopolu. Mr. J. R. Blackwood, the Collector of Birbhum, is of opinion that the rearing of Barapolu race is of great importance in that district. It is proposed to take up this work in Kalitha and also to study the rearing of Tusser. Demonstrations in the villages of Moureswar, Mehedinagar, Bongram, etc., are already being conducted by the staff of the nursery.

In addition to the propaganda work which is being done towards the revival of the industry in localities which were formerly centres of the industry, the Department has undertaken experiments in new areas such as Dacca, Mymensingh, etc. In Bogra work with Eri is also likely to be successful. In Dacca mulberry has given good and hopeful results. In Mymensingh Eri is to be cultivated. It is highly necessary that work should be organised in new areas so as to utilise the potential resources of any locality to the fullest extent.

Research—Hybridisation experiments.

The main work conducted in this connection at Berhampur has been dealt at length in previous reports. The important Hybrid races and the Indigenous races were subjected to field tests and the results have demonstrated that the rearing of hybrid varieties cannot be recommended to the rearers in Bengal owing to their unstable and fluctuating characteristics sufficient definite and reliable data are not yet available to enable us to predict correctly the particular favourable season for rearing any such variety. The Indigenous races on the other hand are stable and perfectly adapted to local conditions. It has therefore been decided to carry on hybridisation experiments on a more

limited scale. The selection of the indigenous Nistary and Chhotopolu as well as Barapolu races will be conducted on a more extensive scale. The results of field tests experiments are appended in Statement (1) of this report.

Manurial tests on Mulberry.

Messrs. Shaw Wallace & Company, prepared a set of chemical manures which were subjected to tests along with other local manures such as cowdung and castor cake. For this purpose six identical plots which had never been manured before were selected and the results noted throughout the year. The respective figures of the yield of leaves from the different plots under trial are appended in Statement (2) of this report. To ascertain whether the quality of the leaves had any bearing on the yield of silk, several special feeding experiments were also conducted. It may be seen from the statement that on the whole castor cake and Messrs. Shaw Wallace & Companys' Basic and Q mixtures have shown satisfactory yield of leaves. Owing to the drought experienced throughout the year, it is quite probable that the chemical manures were at a disadvantage. If there were any ground for supposing that the composition of the manures can determine the quality of the leaves, it can be inferred that R mixture inspite of lesser yield of leaves should be preferred to Basic and Q mixtures in consideration of the relatively greater yield of silk from the worms fed on those leaves. Taking all facts into consideration, castor cake claims preference on account of the relatively greater yield of leaves and also because of the superior yield of silk derived from the worms fed on those leaves in comparison to similar tests with other manures.

Hill amelioration.

The Hybrid races as well as superior exotic univoltine varieties are being reared at Kurseong as usual and the results have demonstrated the utility as well as the urgent need for a well-equipped nursery for the rearing of these races.

The Darjeeling Nursery was used for the Chhotopolu stock for rearing in the plains from September. The results with the hill stock have been satisfactory in most localities in the plains, and argue well in favour of the continuation of this nursery.

The Kalimpong work started by Dr. Sutherland and myself which was handed over to Dr. Jameson for his experiments was taken up again last year owing to the departure of Dr. Jameson. It is intended to conduct special work on Chhotopolu in this nursery so as to arrange that the seed may be directly available after the rearing in the hills in preference to the present system of rearing for two generations in the nurseries prior to selling to the rearers. This would insure a good crop at the rearers' place and at the same time preserve the effects of hill amelioration on the produce as it has been noticed that after two generations in the plains the hill stocks begin to degenerate. Consequently, the usefulness of this station cannot be disregarded.

Co-operative Credit Societies amongst people engaged in the silk industry.

In addition to the six existing Co-operative Credit Societies noted in the previous year, three more have been started during the year under report, viz., two at Amriti and one at Kumarpur. It is satisfactory to note that all these Societies have proved highly successful. This is clearly indicative of the fact that the principle of co-operation is readily taken up by the rearers when it is brought home to them. All these Societies are formed exclusively amongst the rearer class of the industry who possess the requisite credit in the shape of the lands where they grow mulberry. The formation of such Societies, however, amongst reelers is a matter which requires careful consideration but an attempt in this direction could not fail to be appreciated by the community. As a first enterprise I visited several villages and this Department has already suggested a definite line of action by submitting proposals for two such Reelers' Societies for the consideration of the Registrar of Co-opertative Societies, Bengal.

Industrial Exhibition.

Sericultural exhibits were sent to the exhibitions held in Malda, Suri, Bankura and Pabna during the year. Demonstration of reeling and actual rearing were also given in each place.

PRABHAT CHANDRA CHAUDHURI,

Deputy Director of Sericulture, Bengal.

STATEMENT I.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during June crop, 1921.

	Name of races.	No. 1, 53rd generation.	No. 4, 53rd generation.	J. 303, 85th generation.	Nistari.	Chotopalu.
1.	Date of spinning of seed-cocoons	17/18-5-21	17/18-5-21	17/18-5-21	17/18-5-21	17/18-5-21
2.	Date of cutting out of moths ...	26/27-5-21	26/27-5-21	26/27-5-21	26/27-5-21	26/27-5-21
3.	Date of examination of moths	31-5-21	31-5-21	31-5-21	31-5-21	31-5-21
4.	Total number of moths ...	795	794	790	638	630
5.	Number of dead moths rejected	51	49	120	44	72
6.	Total number of moths examined	740	739	662	589	552
7.	Number of moths rejected for Pebrine.	28	30	51	30	32
8.	Number of moths rejected for Flacherie.	112	109	231	41	40
9.	Number of disease-free moths	600	600	380	518	380
10.	Number of improperly laid layings rejected.	4	6	8	5	6
11.	Number of layings rejected for univoltine tendencies.	...	...	...	...	...
12.	Temperature during seed-cutting period.	88° F.	88° F.	88° F.	88° F.	88° F.
13.	Number of layings reared ...	600	600	80	518	80
14.	Average number of eggs per laying.	280	287	250	262	252
15.	Date of hatching	5-6-21	5-6-21	5-6-21	5-6-21	5-6-21
16.	Date of spinning	26-6-21	26-6-21	26-6-21	26-6-21	26-6-21
17.	Temperature during rearing ...	85° F.	85° F.	85° F.	85° F.	85° F.
18.	Total outturn of cocoons ...	118 k. 10 p.	134 k. 2 p.	15 k. 2 p.	104 k. 2 p.	13 k. 10 p.
19.	Disposal of outturn :—					
	(*a*) Quantity kept for seed ...	2 kahons.	2 kahons.	2 kahons.	2 kahons.	1 kahon.
	(*b*) „ „ sample	2 pons.	2 pons.	2 pons.	2 pons.	2 pons.
	(*c*) „ „ cocoons for reeling.	116 k. 8 p.	132 k.	13 k.	102 k.	12 k. 8 p.
20.	Total quantity of leaves used ...	11,664 lbs.	12,857 lbs.	1,609 lbs.	9,809 lbs.	1,443 lbs.
21.	Quantity of leaves rejected, [tender, too hard, dusty, etc.]	240 lbs.	261 lbs.	129 lbs.	137 lbs.	167 lbs.
22.	Quantity of leaves consumed ...	11,424 lbs.	12,596 lbs.	1,480 lbs.	9,672 lbs.	1,276 lbs.

STATEMENT I.

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during June crop, 1921.

Name of races.	No. 1, 53rd generation.	No. 4, 53rd generation.	J. 303, 85th generation.	Nistari.	Chotopalu.
1. Mr. J. de Minvielle's reeling tests :—					
(*a*) Silk in 80 Sicca ...	**8 srs. 3 ch.**	**8 srs. 12 ch.**	**9 ch.**	**6 srs. 11 ch.**	**4 ch.**
(*b*) Quantity of cocoons reeled.	116 k. 8 p.	132 k.	13 k.	102 k.	12 k. 8 p.
(*c*) Kahans of cocoons required per seer of silk.	**14k. 3p. 13½ g.**	**15 k. 1 p. 7½ g.**	**23 k. 1 p. 15½ g.**	**15 k. 4 p. ¾ g.**	**50 k.**
(*d*) Chassam or Floss	4 srs.	4 srs. 12 ch.	9 ch.	4 srs. 1 ch.	8 ch.
2. Comparative estimation :—					
(*a*) Percentage of dead moths.	**6·41**	**6·17**	**15·18**	**6·89**	**11·42**
(*b*) Percentage of Pebrine.	3·72	4	7·7	5	5·79
(*c*) Percentage of Flacherie.	**15·13**	**14·74**	**34·89**	**6·96**	**25·36**
(*d*) Percentage of disease-free moths.	81	81·19	57·4	87·94	68·84
(*e*) Percentage of yield per laying.	**90·38**	**99·69**	**96·8**	**98·2**	**86·5**
(*f*) Number of layings yielding one Kahon outturn.	5	4·47	5·28	4·97	5·87
(*g*) Leaves consumed per Kahon outturn.	**96·21 lbs.**	**93·91 lbs.**	**97·85 lbs.**	**92·88 lbs.**	**93·65 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk. (Calculated from Mr. de Minvielle's figures).	1,358·89 lbs.	1,410·85 lbs.	2,255·21 lbs.	13·94 lbs.	4,682·5 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**12 pons.**	**12 pons.**	**14 pons.**	**12 p. 10 g.**	**1 k. 4 p.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings.)	12 grs.	13 grs.	9 grs.	12 grs.	10 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on 3rd day after spinning (200 readings).	**1·5 grs.**	**2 grs.**	**1 grain.**	**1·5 grs.**	**1 grain.**
3. Variational features observed :—					
(*a*) Larval markings ...	...	...	...	...	...
(*b*) Colour of cocoons	**Yellow**	**Yellow**	**Pale Yellow**	**Yellow**	**Yellow**
(*c*) Any other features	...	...	...	...	...
4. Remarks	...	...	...	...	...

STATEMENT I.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during May crop, 1921.

	Name of races.	No. 1, 52nd generation.	No. 4, 52nd generation.	J. 303, 84th generation.	Nistari.	Chotopalu.
1.	Date of spinning of seed-cocoons	**8-4-21**	**8-4-21**	**8-4-21**	**8-4-21**	**8-4-21**
2.	Date of cutting out of moths	$\frac{17}{18}$-4-21	$\frac{17}{18}$-4-21	$\frac{17}{18}$-4-21	$\frac{17}{18}$-4-21	$\frac{17}{18}$-4-21
3.	Date of examination of moths ...	**$\frac{22}{23}$-4-21**	**$\frac{22}{23}$-4-21**	**$\frac{22}{23}$-4-21**	**$\frac{22}{23}$-4-21**	**$\frac{22}{23}$-4-21**
4.	Total number of moths ...	640	730	725	581	550
5.	Number of dead moths rejected	**200**	**220**	**214**	**340**	**230**
6.	Total number of moths examined.	428	496	494	219	297
7.	Number of moths rejected for Pebrine.	**20**	**22**	**38**	**15**	**17**
8.	Number of moths rejected for Flacherie.	208	274	256	74	150
9.	Number of disease-free moths ...	**200**	**200**	**200**	**130**	**130**
10.	Number of improperly laid layings rejected.	12	14	17	22	23
11.	Number of layings rejected for univoltine tendencies.	...	...	...	...	...
12.	Temperature during seed-cutting period.	87° F.	87° F.	87 F.	87° F.	87 F.
13.	Number of layings reared ...	**200**	**200**	**200**	**130**	**130**
14.	Average number of eggs per laying.	275	280	250	264	252
15.	Date of hatching	**$\frac{26}{27}$-4-21**	**$\frac{26}{27}$-4-21**	**$\frac{26}{27}$-4-21**	**$\frac{26}{27}$-4-21**	**$\frac{26}{27}$-4-21**
16.	Date of spinning	$\frac{17}{18}$-5-21	$\frac{17}{18}$-5-21	$\frac{17}{18}$-5-21	$\frac{17}{18}$-5-21	$\frac{17}{18}$-5-21
17.	Temperature during rearing ...	**84° F.**	**84° F.**	**84° F.**	**84° F.**	**84° F.**
18.	Total outturn of cocoons ...	38 k. 14 p.	41 k. 10 p.	34 k. 10 p.	23 k. 10 p.	20 k. 14 p.
19.	Disposal of outturn :—					
	(*a*) Quantity kept for seed	**1 k. 4 p.**	**1 k. 4 p.**	**1 k. 4 p.**	**1 k.**	**1 k.**
	(*b*) „ „ sample ...	2 p.	2 p.	2 p.	2 p.	2 p.
	(*c*) „ „ cocoons for reeling.	**37 k. 8 p.**	**40 k. 4 p.**	**33 k. 4 p.**	**22 k. 8 p.**	**19 k. 12 p.**
20.	Total quantity of leaves used ...	3,529 lbs.	3,687 lbs.	3,374 lbs.	1,888 lbs.	1,727 lbs.
21.	Quantity of leaves rejected, [tender, too hard, dusty, etc.]	**175 lbs.**	**160 lbs.**	**166 lbs.**	**112 lbs.**	**131 lbs.**
22.	Quantity of leaves consumed ...	3,354 lbs.	3,527 lbs.	3,208 lbs.	1,786 lbs.	1,596 lbs.

STATEMENT I.

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during May crop, 1921.

Name of races.	No. 1, 52nd generation.	No. 4, 52nd generation.	J. 303, 84th generation.	Nistari.	Chotopalu.
1. Mr. J. de Minvielle's reeling tests :—					
(*a*) Silk in 80 Sicca ...	**2 sr. 7 ch.**	**2 sr. 11 ch.**	**1 sr. 15 ch.**	**1 sr. 4 ch.**	**15 ch.**
(*b*) Quantity of cocoons reeled.	37 k. 8 p.	40 k. 4 p.	33 k. 4 p.	22 k. 8 p.	19 k. 12 p.
(*c*) Kahans of cocoons required per seer of silk.	**15 k. 6 p. 3 g.**	**16 k. 15 p. 12½ g.**	**17 k. 2 p. 11½ g.**	**18 k.**	**21 k. 1 p. 1½ g.**
(*d*) Chassam or Floss ...	14 ch.	1 sr. 4 ch	11 ch.	7 ch.	13 ch.
2. Comparative estimation :—					
(*a*) Percentage of dead moths.	**31·25**	**30·13**	**29·51**	**58·51**	**41·81**
(*b*) Percentage of Pebrine.	4·67	4·43	7·69	6·84	5·72
(*c*) Percentage of Flacherie.	**48·59**	**55·24**	**51·82**	**33·78**	**50·5**
(*d*) Percentage of disease-free moths.	46·72	40·32	40·48	59·36	43·77
(*e*) Percentage of yield per laying.	**90·47**	**95·14**	**88·84**	**88·11**	**81.56**
(*f*) Number of layings yielding one Kahon outturn.	5·14	4·8	5·77	5·5	6·22
(*g*) Leaves consumed per Kahon outturn.	**86·27 lbs.**	**84·73 lbs.**	**92·61 lbs.**	**75·59 lbs.**	**76·45 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk. (Calculated from Mr. de Minvielle's figures).	1,298·9 lbs.	1,249·92 lbs.	1,581 lbs.	1,360·62 lbs.	1,605·8 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**14 pons.**	**13 pons.**	**1 k. 1 pon.**	**1 kahon.**	**1 k. 4 pons.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings.)	15 grs.	15·62 grs.	14·2 grs.	14·75 grs.	13·35 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on on the 3rd day after spinning (200 readings.)	**1·75 grs.**	**2 grs.**	**1·4 grs.**	**1·5 grs.**	**1·4 grs.**
3. Variational features observed :—					
(*a*) Larval markings	...	...	...	...	...
(*b*) Colour of cocoons	**Yellow**	**Yellow**	**Pale Yellow**	**Yellow**	**Yellow**
(*c*) Any other features	...	...	...	...	...
4. Remarks	...	...	...	...	...

STATEMENT I.

Comparative figures for different races of silkworms reared at the Berhampore Sericultural Research Station during October crop, 1921.

Name of races.	No. 1, 56th generation.	No. 4, 56th generation.	J. 303, 88th generation.	Nistari.
1. Mr. J. de Minvielle's reeling tests:—				
(*a*) Silk in 80 Sicca ...	**8 ch**	**1 seer.**	**8½ ch.**	**15 ch.**
(*b*) Quantity of cocoons reeled	5k. 12 p.	8 k. 12 p.	6 k.	10 k. 4 p.
(*c*) Kahans of cocoons required per seer of silk.	**11 k. 8 p.**	**8 k. 12 p.**	**11 k. 4 p. 14 g.**	**10 k. 15 p.**
(*d*) Chassam or Floss ...	2½ ch.	4½ ch.	3½ ch.	3 ch.
2. Comparative estimation :—				
(*a*) Percentage of dead moths	**60**	**58·22**	**53·33**	**49·83**
(*b*) „ of Pebrine ...	5·26	5·55	10·76	7·58
(*c*) „ of Flacherie ...	**42·1**	**40·82**	**46·92**	**55·86**
(*d*) „ disease-free moths.	52·62	47·61	42·3	36·35
(*e*) Percentage of yield per laying.	**50·52**	**69**	**65·82**	**70·8**
(*f*) Number of layings yielding one Kahon outturn.	6·34	4·59	6·15	4·39
(*g*) Leaves consumed per Kahon outturn.	**97·9 lbs.**	**96 lbs.**	**95·5 lbs.**	**84·13 lbs.**
(*h*) Leaves required for cocoons to yield one seer reeled silk. (Calculated from Mr. de Minvielle's figures).	1,125·85 lbs.	840 lbs.	1,067·21 lbs.	920·17 lbs.
(*i*) Number of cocoons weighing one seer on the 3rd day after spinning.	**11 pons.**	**9 pons.**	**11 pons.**	**11 pons.**
(*j*) Average weight of one cocoon (with chrysalis) on the 3rd day after spinning (200 readings).	21 grs.	20 grs.	18 grs.	15 grs.
(*k*) Average weight of silky substance in one cocoon (without chrysalis) on the 3rd day after spinning (200 readings).	**2·3 grs.**	**2·5 grs.**	**2 grs.**	**2 grs.**
3. Variational features observed—				
(*a*) Larval markings ...	...	...	...	...
(*b*) Colour of cocoons ...	**Yellow**	**Yellow**	**Pale Yellow**	**Yellow**
(*c*) Any other features ...	...	...	...	...
4. Remarks	...	...	...	...

STATEMENT I.

Data regarding different races of silkworms reared at the Berhampore Sericultural Research Station during October crop, 1921.

Name of races.	No. 1, 56th generation.	No. 4, 56th generation.	J. 303, 88th generation.	Nistari.
1. Date of spinning of seed-cocoons ...	**16-9-21**	**16-9-21**	**16-9-21**	**16-9-21**
2. Date of cutting out of moths ...	27-9-21	27-9-21	27-9-21	27-9-21
3. Date of examination of moths ...	**3-10-21**	**3-10-21**	**3-10-21**	**3-10-21**
4. Total number of moths ...	300	321	300	307
5. Number of dead moths rejected ...	**180**	**187**	**160**	**153**
6. Total number of moths examined ...	114	126	130	145
7. Number of moths rejected for Pebrine.	**6**	**7**	**14**	**11**
8. Number of moths rejected for Flacherie.	48	59	61	81
9. Number of disease-free moths ...	**60**	**60**	**55**	**53**
10. Number of improperly laid layings rejected.	6	8	10	9
11. Number of layings rejected for univoltine tendencies.	...	...	...	...
12. Temperature during seed-cutting period.	83° F.	83° F.	83 F.	83° F.
13. Number of layings reared ...	**50**	**50**	**50**	**50**
14. Average number of eggs per laying	399	403	316	383
15. Date of hatching	**8-10-21**	**8-10-21**	**8-10-21**	**8-10-21**
16. Date of spinning	31-10-21	31-10-21	31-10-21	31-10-21
17. Temperature during rearing ...	**79 F.**	**79 F.**	**79 F.**	**79° F.**
18. Total outturn of cocoons ...	7 k. 10 p.	10 k. 14 p.	8 k. 2 p.	11 k. 6 p.
19. Disposal of outturn:—				
(*a*) Quantity kept for seed ...	**2 k.**	**2 k.**	**2 k.**	**1 k.**
(*b*) ,, sample ...	2 p.	2 p.	2 p.	2 p.
(*c*) ,, cocoons for reeling.	**5 k. 12 p.**	**8 k. 12 p.**	**6 k.**	**10 k. 4 p.**
20. Total quantity of leaves used ...	1,011 lbs.	1,375 lbs.	1,018 lbs.	1,289 lbs.
21. Quantity of leaves rejected, [tender too hard, dusty, etc.]	**240 lbs.**	**330 lbs.**	**242 lbs.**	**242 lbs.**
22. Quantity of leaves consumed ...	771 lbs.	1,045 lbs.	776 lbs.	957 lbs.

STATEMENT II.

Statement showing the outturn of leaves obtained from similar mulberry plots at the Berhampore Central Nursery which were treated with different kinds of manure in November 1920.

[The tests were conducted under identical conditions on one bigha (⅓rd of an acre) plots with 418 bushes] in each.

Serial No.	Name of manure.	Composition of manure.	Quantity of manure applied per bigha.	Total outturn of leaves obtained during six crops reared from January 1921 to February 1922 on same dates.	Relative yield of silk derived by feeding Nistari silkworms on the leaves from respective manured plots.
			cwt. qr. lbs.	Mds. srs ch.	Mds. srs. ch.
1	Basic mixture ...	Nitralin ... 51 lbs. Basic Slag ... 67 ,, Sulph. Potash ... 13 ,,	1 0 19	41 6 0	0 4 1¼
2	Q Mixture ...	Nitro. Mixt. ... 63 ,, Prec. Bone. Phos. 20 ,, Kainit ... 33 ,,	1 0 4	39 13 0	0 2 7⅛
3	R. Mixture ...	Nitro. Mixt. ... 95 ,, Prec. Bone Phos. 20 ,, Kainit ... 33 ,,	1 0 8	35 20 0	0 4 5
4	Cowdung ...	50 mds.	...	33 33 0	0 4 6
5	Castor cake ...	183 lbs.	...	50 16 0	0 4 9
6	No manure ...	...	...	27 33 0	0 2 10⅛

APPENDIX XXV.

ANNUAL REPORT OF THE SERICULTURAL RESEARCH EXPERT TO THE GOVERNMENT OF BENGAL FOR THE YEAR 1921-22.

During the year under review investigations were continued on the inheritance of characters in silkworms and on the behaviour of pure pedigree strains. Some of the practical results obtained so far have opened out fresh channels of investigation which promise to lead to important results in connection with silkworm rearing. A study of the pure pedigree stock shows that there is something else besides actual disease infection which results in a poor yield. Early families of a pure race of silkworms have been found to be more resistant to disease than the later ones. The vitality of the early lots is sometimes so marked that the progeny of even diseased parents give a good crop of cocoons.

Pedigree races of silkworms.

The 303 multivoltine race, a cross between the univoltine (one-brooded) Italian Japanese and multivoltine (many brooded) Indian Nistari started in January 1911 is now in the ninety-fifth generation. Although originally evolved from a cross it is one of the purest strains of silkworms in India and its behaviour from generation to generation, through the year is known and can easily be predicted for any rearing if that date of the *elevage* is given. It usually gives good results in March, April, July, October, November and December.

Table I gives the pedigree from the eighty-sixth generation in March 1921 to the ninety-fifth generation in March 1922. The families shown in table I are the descendants of Nos. 18 and 48 of the eighty-sixth generation of March 1921.

The Ramnagger Madagascar race reared at Alipore since March 1917 is now in the fortieth generation. It is also a pure pedigree strain and always gives good results during the hot weather. Table II gives the pedigree from the thirty-second generation in March 1921 to the fortieth generation in March 1922.

The green worm races which are now in the forty-eighth generation consist of three distinct types—

1. *Transparent green worms* spinning *white cocoons* and becoming moths with *dark-banded wings* and *white eyes.*

2. *Transparent ambar coloured Worms* spinning *yellow* cocoons and moths with dark wings and *white eyes.*

3. *Normal worms* spinning *white cocoons*, moths with *dark-banded wings* and *black eyes.* The normal green worm race is very distinctive in appearance and should be of use as it could be readily recognised if issued to the rearers. This characteristic is important as it is usually in the moth stage that races get accidentally recrossed. It is very difficult to distinguish the various races of Indian multivoltine silkworms in this stage, as a variety like the dark winged green worm strain which is readily recognised in the moth stage can be kept going as a pure strain quite easily by any rearer. The green worm race is very promising and does extremely well during the hot season.

Value of Albino Nut Ants.

This albinism or lack of pigmentation in the green worm races makes the worms appear green or amber coloured according to the colour of the cocoons—the green worms spinning white cocoons and the amber-coloured, yellow. From investigations on the inheritance of the characteristics of this albino race, it has been found that the lack of pigmentation has a remarkable effect in making univoltine eggs hatch almost as well as pure multivoltines. Annual or one-brooded races invariably have pigmented eggs but the green albino worms produce inpigmented multivoltine eggs. The results obtained in some recent preliminary experiments on the inheritance of this albinism appear to be of value as the pigmented eggs of a pure one-brooded female will nearly all hatch like those of a many brooded (multivoltine) silkworm moth when the paternal parent is even a first generation green worm cross, while none of the eggs hatch if the paternal parent is even a pure multivoltine.

Value of Pure Pedigree Strains.

Owing to the numerous rearings of multivoltine races of silkworms in India a rapid progressive increase of disease would be expected in any rearing house. However, from results obtained from time to time, it appears that the *early moths of any race are more resistant to pebrine infection than the late ones of the same race.* But if the *late ones* of the *same rearing are really early ones of another strain of silkworms they will also show the same amount of immunity* as the early ones of the other race (reared at the beginning of the education) although they may be reared side by side with the late pebrinised ones.

It has also been observed that *if a late lot* of a strain *does well it will usually be found to be very distantly related to the early families* and is itself, really *becoming an early lot of a distinct late group.*

MULBERRY.

Selection of Botanically Pure Varieties.

Selection is being contained from both the Sericultural and Botonical view points. Many botanically pure varieties have been selected and are being tested for quality and quantity of leaf production.

Four good varities have been obtained which come in to leaf one after the other. They are being cultivated under the Bengal Bush system, but are planted out in *rows running* as much as possible *due north and south.* This arrangement enables each row to receive the maximum amount of sunlight during the hot and rainy seasons, and an equal amount during the cold season.

Superiority of Cleghorn Mulberry.

A comparative test was made of the Berhampore and Cleghorn varieties of mulberry planted out in the new plantation of about 2½ bighas of land at Tollygunge, which was very kindly lent for mulberry by Mr. R. Dalglish of Messrs. Anderson Wright, Co Twenty of the largest plants, of each, of Berhampore and Cleghorn mulberry which were grown about two feet apart from cuttings planted at the same time between the 8th and 17th October 1920, were cut on the 20th November 1921, after about a years growth, and gave the following results when weighed at about 6-30 p.m. an hour after being cut.

Variety.	Weight of leaf.	Weight of twigs.	Total weight.
Berhampore ...	... 2 lbs. 15 oz.	3 lbs. 5 oz.	6 lbs. 4 oz.
Cleghorn ...	... 4 lbs.	2 lbs. 5 oz.	6 lbs. 5 oz.

The results obtained are very striking. The superiority of the Cleghorn mulberry was apparent in the field as the leaves were much larger and the twigs slimer than that of the Berhampore, but the two varieties did not appear to be of equal total weight.

The bundle of twigs, after being stripped of leaf, of the Berhampore variety was almost twice the size of that of the Cleghorn mulberry.

Arrangement of mulberry to obtain maximum amount of sunlight on leaves and minimum on soil.

The ideal arrangement for rows of mulberry is for the lines to run due North and South. This arrangement gives the bushes the maximum amount of sunlight on their leaves and the minimum amount on the soil between the rows (Diagram I, Plot I). The arrangement shown in Plot, II Diagram, I shows how the shade of a bush falls on its neighbour both in the morning and afternoon.

It has been found that at 3-30 P.M. a bush about 5 feet 3 inches in height throws a shadow 3 feet 10 inches in height on a bush planted at a distance of 2 feet to the East of it, and a shade 3 feet high on a bush standing 3 feet away. At about 4 P.M. a bush 3 feet 3 inches high throws a shadow on the soil of 5 feet 6 inches in length, and on a bush 3 feet to the East of it, a shadow 2 feet 2 inches in height.

As the distance between the mulberry plants in the row is usually about 18 inches apart there is a great deal of overshadowing for at 4 P.M. a bush 3 feet 3 inches high casts a shadow 3 feet high on a bush 18 inches to the East of it.

As mulberry is required to yield as heavy a crop of leaf as possible it is absolutely essential that the plants in the rows should be arranged in such a way as to receive as much sunlight as possible.

The quinquennial arrangement is also good and allows the plants most air and prevents over crowding. In this order (Plot III, Diagram I) *each bush* is 3 feet apart instead of the rows being 3 feet apart. For trees the quinquennial order is the best; the trees are from 5 feet to 10 feet apart according to the size of the plantation.

Manures for mulberry.

The trees of Cleghorn mulberry at Alipore still continue to give heavy crops of leaf and show no sign of diminishing yield although the leaf is gathered five times in the year.

The plantation at Alipore has had only one dressing of tank earth and cow dung in March 1915, and tank earth again in 1919, and a dressing of lime in November 1921. All the plots, however, are deeply dug up as often as possible and green manure (gram, sun hemp, and ground-nut) is sown at the commencement of the cold season or rains, in every alternate row. This arrangement leaves one row between the bushes free for standing in when gathering the leaf. It also allows of every alternate row being dug up, after the leaf is gathered. The next crop of green manure is sown in the row which was left untreated.

Heavy manuring not required for mulberry.

So far heavy manuring has not been found necessary for the mulberry plantation at Alipore. Two dressings of tank earth, and one of cowdung and lime, during seven years, with a crop of green manure every cold season, along with frequent and deep cultivation, appears to have been sufficient to keep up a non-diminishing return of leaf for the last seven years.

Plant vitamines—Organic matter and soil-aeration.

The successful results obtained from the treatment of the soil in the mulberry plantation at Alipore clearly shows the importance of having a supply of organic-matter and soil organisms kept up in the soil.

The mulberry has grown healthly and luxuriantly for many years, and it appears to be due to the small quantities of organic manures applied in conjunction with deep cultivation, which has supplied it with what may be called "plant vitamines" in the form of organic-matter, soil bacteria and free oxygen.

M. L. CLEGHORN,

Sericultural Research Expert.

TABLE I.

PEDIGREE OF MULTIVOLTINE 303 SILKWORM RACE.

This table gives the generation, number of moth and laying, date of each elevage, the number of cocoons, to each laying in brackets.

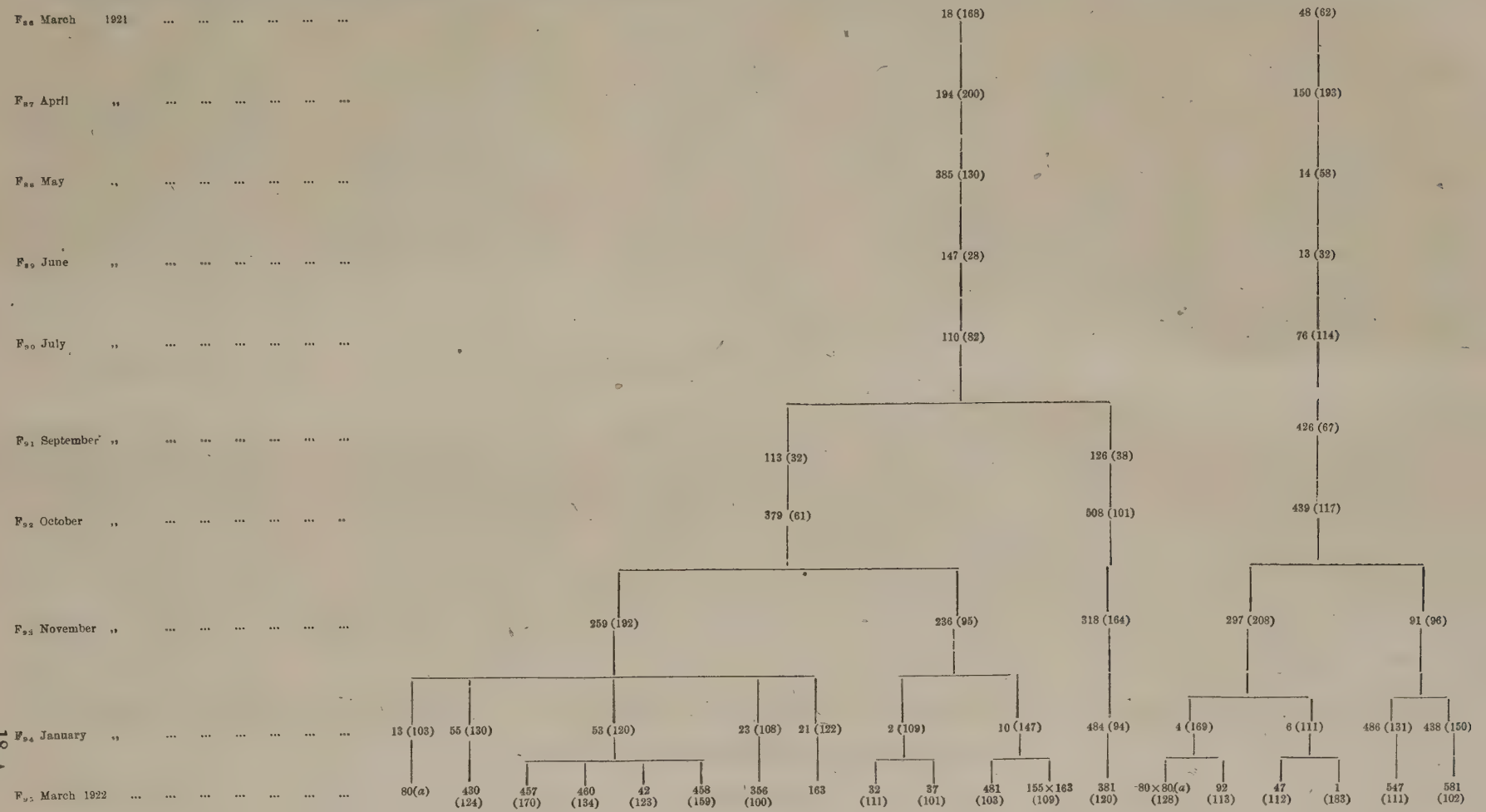
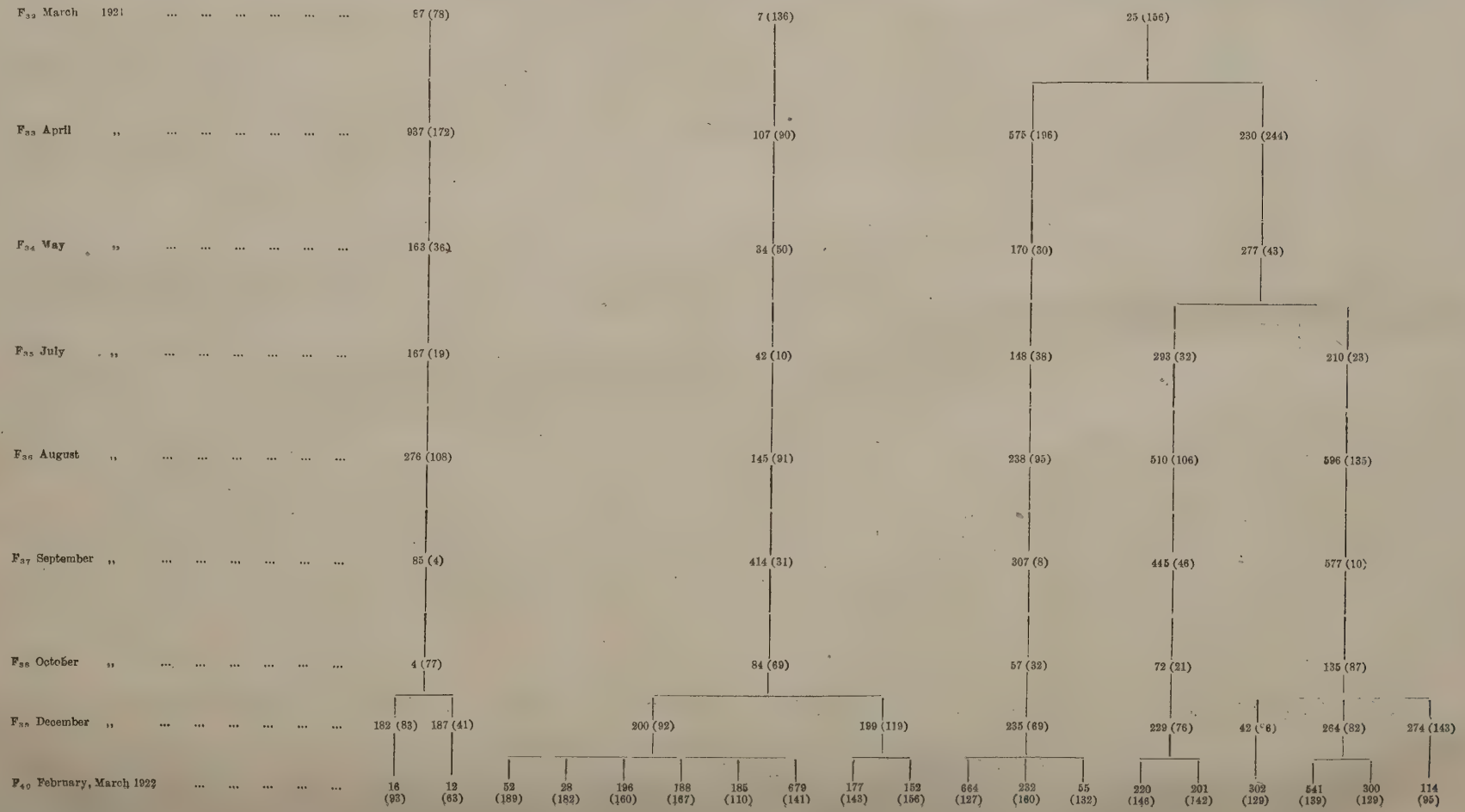


TABLE II.

PEDIGREE OF RAMNUGGAR-MADAGASCAR RACE.

This table gives the generation, number of moth and laying, date of each elevage and the number of cocoons to each laying in brackets



APPENDIX XXVI.

Annual Report on the working of the Sericultural School, Rajshahi, for the year 1921-22.

Administration.

The institution was made over to Government in 1907; since then it is being managed by a local committee under the Director of Agriculture, Bengal.

Curriculum.

The school teaches the following subjects :—

(*a*) Mulberry cultivation.
(*b*) Microscopic seed selection.
(*c*) Detection and prevention of silk-worm diseases.
(*d*) Rearing of silkworms.
(*e*) Reeling.

It has now been generally recognised that the introduction of improved methods of reeling is an important factor in the rivival of the silk industry and with the approval of the Director of Agriculture, Bengal the reeling section was opened in August last; an improved form of country reel selected by Mr. Pillai, Superintendent of Textile Demonstration, has been set up and the students have been working in the reeling class for three days in the week. In addition to this formal curriculum the students are receiving instructions in Vernacular, Arithmetic and Hygiene two hours every day as suggested by the Director of Agricultnre, Bengal, last year. I believe this has improved the general tone of the school.

Land.

The school has in possession 22 bighas of land at Kaderganj within a mile of the school, of which 17 bighas are under mulberry cultivation. A portion of the land goes under water during the rains almost every year and hence the September crop suffer. A scheme for draining the land has been prepared in consultation with the District Engineer which, I hope, will be worked out before the rains set in. The land has been considerably improved by heavy manuring this year and I trust this will substantially increase our outturn next year. About 500 cuttings of tree mulberry were obtained which have been planted all round the mulberry fields at a distance of ten to twelve feet apart.

Seed Supply.

During the year under report three crops of Nistari worms were raised and the September crop of Chhotopalu failed through want of mulberry leaves. The total quantity of outturn from the above three crops was 294 kahons as compared with 216½ kahons in 1920-21 and 255 kahons in 1919-20. Of the above quantity of seed cocoons 281 kahons were sold to the "Busnies" and 13 kahons were kept in the school for microscopic examination by the students. The total receipts by way of sale-proceeds during the year amounted to Rs. 849-2-6 against Rs. 505-1 in 1920-21 and Rs. 505 in 1919-20. The cocoons grown in this school are gaining popularity among the 'Bashnies' as is shown by the fact that they have been sold out this year from the school. This has saved us a good deal of trouble and expenses in taking our cocoons to Malda for sale as was used to be done in previous years.

Teaching Staff.

There is a headmaster who teaches Sericulture and with the help of a rearer practical rearing is taught. During the year under report the staff has been strengthened by the appointment of a temporary assistant teacher and clerk who teaches vernacular, arithmetic and hygiene and a reeler who instructs the students in practical reeling. The headmaster from time to time visits the model rearing houses started by the passed students of the district and gives instructions to the village Bashnies with regard to the rearing of silkworms on scientific lines. Model nurseries have been started by the ex-students of the school and it is gratifying to note that they are faring well by rearing silkworms.

I beg to acknowledge with thanks the good services rendered by the present Headmaster Babu Pulin Behari Bhattacharjee in re-organising the school and making it more efficient.

Students.

During the year under report there were 12 students on the roll of which 10 appeared in the final examination and of these five passed. Of the 12 students seven belong to Rajshahi, four to Malda and one to Murshidabad.

During the present session 1922-23 there are altogether 12 students on the roll, of which nine belong to Rajshahi and three to Malda. Of the 12 students eight are Mahomedans and four Hindus. The popularity of the school is rapidly increasing as we had 46 applicants for admission this year of whom 31 belonged to Rajshahi; for some time past we have been pressing the Director of Agriculture, Bengal, for increasing the number of students but no favourable reply has been received yet.

Receipts and expenditure during the year 1921-22 :—

Receipts.	Rs.	A.	P.
Budget grant	5,974	0	0
Sale proceeds	849	2	6
Deputy Director of Sericulture, Bengal	30	0	0
Total ...	6,853	2	6

Expenditure	Rs.	A.	P.
Pay of the staff	1,187	12	3
Stipends to students ...	1,248	9	8
Books and maps	20	0	0
Instruments and appliances ...	399	1	0
Petty constructions and repairs	499	8	3
Furniture	30	0	0
Rents, rates and taxes ...	216	12	9
Miscellaneous and office expenses	2,368	0	9
Remittance to Treasury ...	849	2	6
Total ...	6,818	15	2

Microscopes.

There are altogether seven microscopes of which three are useless.

Discipline.

No case of breach of discipline occurred during the year under report.

Inspection and visits.

The school was visited by the Hon'ble the Minister in charge of Agriculture and Industries, the Commissioner, Rajshahi Division, the Director of Agriculture, the Deputy Director of Sericulture, the Superintendent of Sericulture and the Superintendent of Textile Demonstrations.

Meetings.

Five meetings of the Managing Committee were held during the year under report. The Committee has been strengthened by the inclusion of the Deputy Director of Sericulture, Bengal.

H. D. Mukherjee,

Secretary, Sericultural School, Rajshahi.

APPENDIX XXVII

GLOSSARY.

Vernacular.	English name.	Scientific name.	Remarks.
Aghani ...	Winter crops.		
Aughraunbund ...	It lasts from about the middle of November to the middle of December for silk crops.		
Aman ...	Winter paddy ...	Oryza sativa.	
Amrita sagar ...	A variety of benana ...	Musa sapientum.	
Arhar ...	Pigeon pea ...	Cajanus indicus.	
Aus ...	Autumn paddy ...	Oryza sativa ...	It is called Ghaiya in Kalimpong district.
Badshabhog ...			
Bhabanibhogh ...			
Betho ..			
Chapalo ...			
Charnock ...			
Dadkhani ...			
Depi ...			
Digha (broadcasted aman). ...			
Dudsar ...			
Elai ...			
Gangajali ...			
Garia ...			
Gazia ...			
Hatisal ...			
Indrasail ...			
Hasoah ...	Varieties of paddy ...	Orya sativa.	
Jatakalma ...			
Jhengasail ...			
Kashiapanja ...			
Kataktara ...			
Kataribhog ...			
Kaminisail ...			Dhanasi.
Kele ...			Mansara.
Marichbuti ...			Ramtulsi.
Nagra ...			Ramtomarsi
Panisail ...			Timurary.
Sonamail ...			Touli.
Samras ...			These are the varieties of paddy of the district of Kalimpong.
Samuddrabali ...			
Suryamukhi ...			
Tilakkachari ...			
Bhatmas ...	Soybean ...	Glysine Hispida ...	It is the Nepali name of soybean, the Lepcha name being Silliyan.
Barind ...	A tract of comparitively high land with a stiff soil of reddish clayey loam which runs throuh the districts of Rajshahi, Malda, Dinajpur and Bogra.		
Bhashnis ...	Bengal silkworm rearers.		
Bigha ...	A bigha is equal to one-third of an acre.		
Bhodes ...	Clayey deposit in old tanks.		
Beel land or bhil	.....	.....	Lowlying lands which serves as reservoirs of flood water during the rain.
Bhadoi ..	Autumn crops.		
Bhideshi ...	Foreign, exotic.		
Bogi seed ...	Seed of a variety of jute called Bogi.	Corchorus sp.	

Vernacular.	English name.	Scientific name.	Remarks.
Bunds ...	Seasons for silk crops.		
Bundh ...	An embankment by the side of a river.		
Buri ...	A variety of cotton ...	Gossipium sp.	
Chotopoloo ...	A variety of silkworm.		
Chhusum ...	Waste silk.		
Dharwar ...	A variety of cotton ...	Gossypium sp.	
Dhaincha ...	.....	Seabania aculeats.	
Deshi ...	Indigenous.		
Deshi tunt or tut ...	Mulberry ...	Morus indica ...	It is called Cl kimbu in Ka pong district.
Dones ...	An appliance for irrigation.		
Gangajali ...	A variety of wheat ...	Triticum sativum.	
Gur ...	Molasses.		
Gahat or Kulthi ...	Horsegram ...	Delichos Biflorus	Gahat being Nepali name.
Jhills ...	Small lakes.		
Joars ...	Groups of villages ...	.....	Techical term u in Sericulture.
Joar ...	Sorghum ...	Sorghum vulgare.	
Dukhary ...	Varieties of millet ...	Ditto ...	It is called kodo Kalimpong.
Fulgar ...			
Sundhia ...			
Kahan ...	1,280 units make one kahan.		
Kutcha ...	Mud built.		
Kalai or mati kalai	A variety of pulse ...	Phaseolus radiatus.	
Kharif season ...	Winter season.		
Khesari ...	A variety of pulse ...	Lathyrus sativa.	
Khar ...	Thatching grass.		
Maund ...	It is equal to 82·31 lbs.		
Mashyem ...	A sort of gram ...	Phaseolus calcuratus.	It is a Nepali nam
Mela ...	Fair.		
Mung ...	A variety of pulse ...	Phaseolus Mungo.	
Nistari ...	A variety of silkworm.		
Pucca ...	Brick built.		
Rabi season ...	Spring season.		
Rohit ...	A variety of big fish of the carp species.		
Til ...	Gingelly ...	Seasamum indicum.	
Ufra ...	An eel worm disease of rice.	Tylenchus sp.	
(*i*) Dacca Bas ...	Varieties of jute ...	(*i*) Corchorus capsularis.	
(*i*) Fandak ...			
* Hooghly Deshi			
(*i*) Hewti ...			
(*i*) Kakiabombay			
(*i*) Simulkandi			
* Tosha ...		* Corchorus olitorius.	
Bhengi ...	Varities of tobacco ...	Nicotina tobaccum.	
Bispat ...			
Hamaku ...			
Matihari ...			
Naokhol ...			
Gandari ...	Varieties of sugarcane	Saccharum officinarum.	
Shamsara ...			
Khagri ...			
Vendamukhi ...			

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BENGAL

SCALE:- 1" = 40 MILES

REFERENCES

- Dist Boundary
- Divisnal Do
- Govt Dist Farm
- Supdt of Agriculture
- D. A. O.
- Private Farm
- Govt Seed Store
- Private Do Do (Demonstrators)
- Agricultural School — X
- Seril Nursery — S
- Tobacco Farm — T
- Cattle Do — C

88° 90° 92°

28° 26° 24° 22°

DARJEELING · Sk. Rimpong · Nagrakata · Kursaong · Gopaldara · Sukna · Salugari · Adhikari · Mainaguri · Madarihat · Dalsingpara · Kumargram · Falakata · Alipur · JALPAIGURI · Pirganj · Haldibari · GOOCH BEHAR · Pulbari · Boda Chukla · Thakurgaon · Haldibari · Dimla · Dahala · Pateswari · Jaldhaka · Bhuragaht · Nageswari · Nilphamari · Fatakari · Lalmanirhat · Pirganj · Chandipur · Dhap · RANGPUR · Khalisakura · Kurigram · Bukni Hat T · Chilakhoti T · DINAJPUR · Lalbag · Tapa Nadhan · Ulipur · Alamnagar · Mitapukhur · Tetpur · Bhatsara · Gobindaganj · Tulsikata · Bochamaria · Hyatpur · Gajol · Balurghat · Dharampur · Aokhandi · Panchabibi · Fulchari · Jujpur Hat · Diwanganj · Nilfamari · Komalgany · Old Malda · ENGLISH BAZAR · Peashari · Mehadebpur · Amrita · Akkelpur · Burugany · Paikar · BOGRA · Naogaon · Nasratpur · Brahmaputra · Netrakona · MYMENSINGH · Kathkhali · Ramnagar · Muktagacha · Santosh · Gopalpur · Pakab · Azugitola · Kishorganj · Mahara · Goffargaon · Kakudi Hat · Kaliganj · Nawabganj · Tahirpur · Singra · Sherpur · Bhuttaria · Sibnagar · Dighapatia · Natore · Rajpur · Sirajganj · Pathia · Dogachia · Sonkonda · Tangail · Jhenaidah · Kumarpur · Faridpur · Mirpur · Bilmaria · Kapasia · Nagarpur · Rajendrapur · Bhairab Bazar · Kasba · TAGARTALA · Brahmanbaria · Kalapur · Sirajganj · Pakshi · Pabna · Dasuria · Nazirpur · Alamdanga · Goalunda · Archna · Nawhgany · Manikganj · Kazimpur · Sinclair · Pulbaria · DACCA · Kakraban · Sunga · COMILLA · TIPPERA · Chandina · Doudkandi · Munshiganj · Faridpur · Goalchamat · Nurpur · Kanksa · Bhanga · Damudya · Tipakhola · Laksam · Nasirnagar · Bitnea · Baro Paigaon · Gorakpa · Polong · Madaripur · Lohagara · Gopalganj · Charmenda · Sechuria · Hotalipara · Gournadi · Tilasori · Kairgan · Bhitkhali · Chhagalnaia · Basarhat · Pulgaon · Fenny · Durgapur · Kyeongghatpara · Bagamganj · SUDHARAM · NOAKHALI · Hinguli · Mirsarai · Fatickchari · Romani · Raozan · RANGAMATI · Sitakunda · Barisal · Bagherhat · Mahanandigany · Bhola · Jhalakati · Jayanagar · Bakergunge · Banshi · Patiya · Sandip · CHITTAGONG · Patiya · Nalchira · Matbarpur I. · Patuakhali · Bangana · Amtali · Bondora I. · Tetulia R. · Donmanick I. · Rabnabad I. · Kutubdia I. · Chakoria · Thonarch · Markhia · Cox's Bazar · Dianna Dhagy · Salkanda · Rasidarghona · Patia · Nhenchay · Hathazari · Deppa · Saral · Kalgram · Sanglish · Bhairab Bazar · Kasba · Brahmanbaria · Kalapur · Sirajganj · Pakshi · Pabna · Dasuria · Nazirpur · Alamdanga · Goalunda · Archna · Nawhgany · Manikganj · Kazimpur · Sinclair · Pulbaria · DACCA · Kakraban · Sunga · COMILLA · TIPPERA · Chandina · Doudkandi · Munshiganj · Faridpur · Goalchamat · Nurpur · Kanksa · Bhanga · Damudya · Tipakhola · Laksam · Nasirnagar · Bitnea · Baro Paigaon · Gorakpa · Polong · Madaripur · Lohagara · Gopalganj · Charmenda · Sechuria · Hotalipara · Gournadi · Tilasori · Kairgan · Bhitkhali · Chhagalnaia · Basarhat · Pulgaon · Fenny · Durgapur · Kyeongghatpara · Bagamganj · SUDHARAM · NOAKHALI · Hinguli · Mirsarai · Fatickchari · Romani · Raozan · RANGAMATI · Sitakunda · Barisal · Bagherhat · Mahanandigany · Bhola · Jhalakati · Jayanagar · Bakergunge · Banshi · Patiya · Sandip · CHITTAGONG · Patiya · Nalchira · Matbarpur I. · Patuakhali · Bangana · Amtali · Bondora I. · Tetulia R. · Donmanick I. · Rabnabad I. · Kutubdia I. · Chakoria · Thonarch · Markhia · Cox's Bazar · Dianna Dhagy · Salkanda · Rasidarghona · Patia · BERHAMPUR · Murshidabad · Laibag · Lalpur · Kumarpur · Azimganj · Jangipur · Ramjanhat · Khunjgaon · Rajnagar · Sonatia · Rajapur · Burwa · Chandanpur · Dadpur · Karimpur · Uttarpur · Jagatdanga · Jalkar · Chandpur · Ghiratia · Nadia · Nabadwip · Shantipur · Ranaghat · JESSORE · Narail · Santa · Manirampur · Phultala · Kesabpur · Bongaon · Barasat · Basirhat · Taki · Hasnabad · Hingalganj · Gosaba · Basanti · Canning · Jaynagar · Mathurapur · Diamond Harbour · Sonakhali · Mahishadal · Contai Rd. · Contai · Gosaba · Jamira R. · Bulchery · Malta R. · Dalhousie I. · Bhangaduni I. · Gosaba R. · Raymangal R. · Kanpur R. · Bainsara R. · Haringhatta R. · Hooghly R. · Saugor · Fraserganj · Nhan · Chuchra · Jara · Jhargram · Midnapore · Kharagpur · Gopinathpur · Tamluk · Egra · Ishwaripur · Malta · Baruipur · Ishaqpur · Pachkura · Bishnupur · Falta

GOVERNMENT OF BENGAL.

DEPARTMENT OF AGRICULTURE AND INDUSTRIES.

Agriculture.

CALCUTTA, THE 10TH FEBRUARY 1923.

RESOLUTION—No. 677Agri.

Minister in charge: The Hon'ble Nawab Saiyid Nawab Ali Chaudhuri, Khan Bahadur, C.I.E.

READ—

The Report of the Department of Agriculture, Bengal, for the year 1921-22.

MR. G. EVANS, C.I.E., held charge of the department throughout the year. Mr. K. McLean proceeded on combined leave for one year from the 18th October 1921, and Mr. J. N. Sarkar of the Bengal Agricultural Service continued to act as a Deputy Director of Agriculture. Mr. R. S. Finlow, the Fibre Expert, who went on leave in April 1921, returned in February last. Mr. McLean acted as Fibre Expert till he went on leave in October 1921, and Babu Nirmal Chandra Basu, Assistant Fibre Expert, acted in the post during the remaining period of Mr. Finlow's leave. Five new posts were created during the year in the cadre of the Bengal Agricultural Service, viz., one for the Superintendent of the Chinsura farm, one for the Superintendent of the Darjeeling district, and three for the head assistants of the Fibre Expert, Agricultural Chemist and the Economic Botanist, respectively. Mr. N. Gupta, Superintendent of Agriculture, was placed on special duty in connection with agricultural education. Mr. P. C. Chaudhuri, Superintendent of Sericulture, was appointed to the Indian Agricultural Service as probationary Deputy Director of Sericulture in October 1921. Babu Surendra Nath Bose was confirmed in his appointment as first Superintendent of Sericulture, and Maulvi Shaik Abdullah, Sub-Deputy Collector, was appointed on probation as the second Superintendent of Sericulture.

2. During the session 1921-22, the number of Bengal students at Sabour was 35. Of these 12 passed the final examination, and 18 were promoted from the first to the second year class. The Sabour College will close at the end of the session 1922-23, and consequently the necessity for establishing a suitable institution for imparting higher agricultural education within the presidency of Bengal has now increased. Meanwhile, the Bengal students will have to seek admission into other provincial agricultural colleges. The scheme for the establishment of the Agricultural Institute at Dacca could not be pushed forward for want of funds, and consideration of the Retrenchment Committee's report may cause further delay. The two experimental agricultural vernacular schools at the Dacca and Chinsura farms continued to show good progress. The original aim of these schools was to train the sons of *bona fide* cultivators in up-to-date methods of scientific agriculture and to combine with this a little general education. But as the result of a discussion at the provincial Board of Agriculture in 1921, these two schools have now been converted into secondary agricultural schools with the object of giving a higher form of training to older boys who are also sons of cultivators, or of those who have a direct interest in the land. The curriculum has been so framed as to provide for training the students (*a*) in farming their own lands, or (*b*) as demonstrators in the department, or (*c*) as teachers in the proposed farm schools (elementary agricultural schools). There are now 12 stipendiaries in the first year class, besides four others who study at their own expense, while the second year class consists of 15 students including nine apprentices recruited from men under temporary training on the farm. At Chinsura there are 11 new recruits in the first year class, and 10 students in the second year class.

Since he has taken office the Hon'ble Minister has devoted special attention to the question of agricultural education. After a full consultation with the departmental officers he formulated a comprehensive scheme which was published with Government resolution No. 798 Agri., dated the 17th February 1922, inviting public opinion thereon. The criticisms received were discussed at a meeting of the provincial Board of Agriculture after the close of the year, and the original scheme with certain modifications were finally adopted. Under this scheme agricultural institutions are divided into three grades, viz., (1) higher, (2) secondary, and (3) lower, according to the class of instruction which they impart. The proposed Agricultural Institute at Dacca is meant to provide higher education in agriculture, while the schools on the lines of those at Dacca and Chinsura fall into the second category of secondary agricultural schools. The third class of the farm (elementary agricultural) schools are meant to be cheaper institutions, the number of which should be gradually increased. It was in contemplation to start two more secondary agricultural schools (at Rajshahi and Rangpur) and a number of farm (elementary agricultural) schools during the current financial year, but financial stringency has unfortunately stood in the way. The detailed schemes in regard to these schools are, however, being scrutinised and prepared so that they may be ready when the financial resources of the province admit of their being undertaken.

3. It is satisfactory to note that the research work of the department maintained good progress in all its three sections, viz., Fibre, Botanical and Chemical.

As usual, jute received the special attention of the Fibre Expert, though minor investigations were also carried out in hemp, flax and other fibres. Out of 559 single plant cultures of C. Capsularies and a number of hybrid races under observation only ten have shown favourable indications. But the standard new races R 85 and D 154 which were expected to prove superior even to the well-known "Kakya Bombai" have kept up their reputation in this competition as being excellent yielders, besides being immune from the attack of *Chlorosis*. With regard to *Chlorosis* in jute, investigations in collaboration with the Economic Botanist were continued, and it is reported that there is possibly a connection between the development of the surface root system and the incidence of the disease, and that the liability to or immunity from the disease is hereditary in character. Experiments were continued at Pusa on a new machine designed for extracting fibre from *sunn hemp*. With regard to flax, samples of the crop grown at Cawnpore were well reported on in London. Investigations were also made with *sida* (*Sida rhombipolia*) and *sisal* (*Agavi sisalana*).

In pursuance of a resolution passed at the meeting of the Bengal Legislative Council held on the 22nd February 1921, a committee was appointed in the following June to devise ways and means to eradicate the scourge of water hyacinth which with its abnormally rapid growth has become a menace to the public. The Committee's report, received after the close of the year, is now under the consideration of Government.

4. In the Botanical section three recent selections of *Aman* paddy were tested at Dacca against the much reputed *Indrasail* and proved to be very heavy yielders. At Chinsura the new variety *Dudsar* mentioned in the last report beat the local *Nagra* of old fame by 14 per cent. This variety is earlier in ripening than *Indrasail*, but otherwise similar and it is expected to prove very suitable to Western Bengal.

The high prices of cloth during the recent years and other connected reasons have led the public to devote an unusual amount of attention to the subject of cotton cultivation. The question has been discussed in the press as well as in the Legislative Council, and enquiries have been made as to the steps taken by Government to extend the cultivation of this special crop in Bengal. Fortunately the head of the department at the time, Mr. Evans, happened to be a specialist in cotton. His pamphlet on the subject entitled "A Brief History of Experimental Cotton Cultivation in the Plains of Bengal" abundantly illustrates that he has spared no pains to make a thorough

investigation into the possibilities of cotton cultivation in this province. But his main conclusion, as repeated in the report under review, has been that climatic conditions stand in the way of successful cultivation of this crop in Bengal. Besides, the question is an economic one ; the cultivators are not likely to give up jute at its present price in favour of cotton. This was conclusively proved by the fact that there is little, if any, real demand from genuine cultivators for cotton seed distributed by the department. Government, have, however, decided that the question of cotton cultivation must now be settled once for all, and experimental cultivation of the crop at Government farms will be continued until this end is achieved. A Cotton Committee has been formed to advise Government on its policy with regard to this work, and a cotton survey of the province is being conducted by the second Economic Botanist. Experimental work on the cotton crop continued mainly at Chinsura, Dacca and Mymensingh. As promised in the preceding report, cotton was also tried as a winter crop at Dacca and Mymensingh, but as it did not do well owing to unfavourable weather conditions, the experiments are being repeated in the current year.

5. The activity of the Chemical section has been great in the year under review. Soil investigation including numerous analyses as well as a study of the action of bone phosphate on acid soils, cane sugar, date sugar and tobacco are all items in the varied programme of this section.

The Indian Sugar Committee's report was considered during the year. The main conclusion of the Committee is that in Bengal there is at present little prospect for expansion of the sugarcane area. The climatic and soil conditions of the Burdwan and Presidency Divisions, however, offer some ultimate possibilities in this direction. The work in connection with the date sugar industry has been in abeyance since Mr. Annet left the province, and the Committee recommended that it should be revived and prosecuted to a conclusion. Government notice with pleasure that the work has been resumed by Mr. Carbery.

With regard to tobacco a number of analyses have been made, and the manuring requirements of the crop are being carefully studied. Experiments were also made with flue-curing of the leaf.

6. The programme of starting a few more district farms during the year, in pursuance of the general policy of having an agricultural farm in every district, could not be fully carried out for want of funds, with the result that the major half of the presidency is yet without district farms. The thanks of Government are due to the Hon'ble Maharajadhiraja Bahadur of Burdwan for having made over to the Agricultural Department the Burdwan farm which is now being conducted as a district farm.

7. Although it is very encouraging to note that the system of distributing improved seeds through private agencies, described in the previous report, has worked successfully and offers scope for further expansion, it is evident that these new agencies require strict supervision, as already several cases of supplying inferior seeds have been detected and the agencies concerned had to be struck off the list of recognized suppliers. There are at present 52 private seed farms, the enterprise mainly of private zamindars, agricultural co-operative associations, khas mahal estates and Court of Wards estates. The Hon'ble Minister acknowledges with thanks the services rendered by these private agencies. The work done by the khas mahal farm at Jessore and the wards' estates farms at Paikar (Bogra), Brahmanbaria (Tippera) and Bhowal (Dacca) deserves special mention. The cultivators are now convinced that departmental jute seed yields 25 per cent. more than the local kinds, and the demand for the former has consequently been much greater than the supply. The seeds of *Indrasail* variety of *Aman* and *Kataktara* variety of *Aus* paddy were also in considerable requisition, and the demand for the yellow *Tanna* variety of sugarcane was too great to be fully met.

8. During the year under review the provincial Board of Agriculture has been reconstituted on a more popular and representative basis so as to include both official and non-official members with the Director of Agriculture as president. The scheme for organising agricultural associations on a

co-operative basis, referred to in the preceding resolution, has made a good beginning in the Pabna district. Government will watch with interest the working of these pioneer societies which seem to be so full of promise Co-operative irrigation societies have been started in Bankura, Midnapore and Birbhum districts, and an Irrigation officer has temporarily been appointed with the object of helping these societies in the selection of suitable sites, also in preparing plans and estimates and in advising them generally.

9. The investigations at the Government cattle-breeding station at Rangpur continue. They include cross-breeding between Hissar bulls and local cows and selective breeding of local cattle. The object of the investigations is to provide a dual purpose animal in which the male will prove a good draught bullock and the female a good milk yielder. Gratifying progress is being made. Only three years ago, in carrying out the first selection process, it was necessary to lay down a minimum standard milk yield as low as 500 lbs. of milk per lactation period of 300 days. Even this meant the weeding out of many animals from the herd, and when this has been done, it was immediately obvious, from a comparison between the rejected animals and those which had passed the test, that many cows do not give enough milk even to feed their young. To-day the best cows at Rangpur are giving over 3,000 lbs. of milk per lactation period and, as the similar but further advanced work at Pusa has shewn that the milking strain is prepotent in the sire, there is every reason to hope that Bengal is, as far as the improvement in the animal is concerned, making real progress towards a solution of its very acute cattle problem. The policy to be followed is the distribution and sale of pedigree bulls in all parts of the province and a commencement has already been made at some of the Government farms. It has however to be remembered that the question of fodder is just as important as that of the animal. The cow, however well-bred, cannot give large quantities of milk if she is improperly fed, any more than an under-fed bullock can do good work. The plant breeding section of the department has already attacked the fodder problem, and encouraging results have been obtained. Irrigation will undoubtedly greatly help the production of fodder crops in many parts of the presidency.

Apart from the cattle-breeding experiments at Rangpur, small herds of red Scindi and Montgomery cattle have been established at Dacca and Chinsura respectively, but it is too early as yet to comment on their possibilities under Bengal conditions. That there is a shortage of milk and other dairy produce in the province is well known, and the public have naturally shown great interest in the question of improvement of cattle in this presidency. Government fully share the Director of Agriculture's views that as a preliminary step in formulating a comprehensive cattle-breeding policy to be followed in Bengal the appointment of a cattle-breeding expert is a matter of urgency. This appointment was also recommended by the Board of Agriculture, India, at their meeting held in February 1922. The Legislative Council has hitherto refused to vote the necessary funds, but Government hope that an improvement in the financial situation will hasten ratification of the appointment.

10. The Sericultural Department came under a thorough review during the year. The policy hitherto followed has been to produce pure seed at the Government nurseries for sale to private rearers at the best rates obtainable. Obviously Government cannot expect to supply all the seeds required, and as a matter of fact the seeds produced at Government farms are only about 18 or 20 per cent. of the demand. The policy, therefore, called for re-examination. With this object in view, the Hon'ble Minister in charge visited the chief sericultural centres of the province and held a conference in March last to discuss the question at which not only the members of the Bengal Silk Committee, but other gentlemen interested in the industry, were invited. It was decided at the conference that the future policy in regard to this matter should be to organise the private seed producing system so as to act as an intermediate agency between the Government nurseries on the one hand and the commercial concoon growers on

the other. It was also decided that Government nurseries should not be conducted on commercial lines, but that they should be regarded mainly as demonstration centres and as a means of educating the professional rearer class. Steps are being taken to give effect to the several resolutions passed by the conference.

The total receipts from the nurseries amounted to Rs. 79,381 as against Rs. 77,286 during the previous year. The demand for sericultural education continued to be on the increase.

11. The Hon'ble Minister would take this opportunity of placing on record his high appreciation of the work done by Mr. G. Evans, C.I.E. He joined his post as the Director of Agriculture, Bengal, shortly before the introduction of the Reforms scheme, and the Hon'ble Minister is grateful to him for his loyal co-operation in all matters in which his advice and assistance were sought. In his departure since the close of the year the province has suffered a distinct loss. The acknowledgments of Government are also due to the other officers of the department mentioned in the report, and particularly to Messrs. Hector, Carbery, Finlow, N. Gupta and P. C. Chaudhuri.

By order of the Government of Bengal
(Ministry of Agriculture and Public Works),

J. T. DONOVAN,

Secretary to the Government of Bengal (*offg.*).

No. 678Agri.

Copy forwarded to the Director of Agriculture, Bengal, for information.

By order of the Government of Bengal
(Ministry of Agriculture and Public Works).

A. ZAMAN,

Assistant Secretary to the Government of Bengal (*offg.*).

Calcutta :

Dept. of Agri. and Industries—*Agri.*,
The 10th February 1923.

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